# Chinook Salmon Studies in the Nechako River: 1980, 1981, 1982

L.R. Russell, K.R. Conlin, O.K. Johansen and U. Orr

Department of Fisheries and Oceans
Habitat Management Division
1090 West Pender Street
Vancouver, B.C. V6E 2P1

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Department of Fisheries and Oceans
Habitat Management Division
1090 West Pender Street
Vancouver, B.C.
V6E 2P1

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## ABSTRACT

Russell, L.R., K.R. Conlin, O.K. Johansen and U. Orr. 1983. Chinook salmon studies in the Nechako River: 1980, 1981, 1982. Can. MS Rep. Fish. Aquat. Sci. 1728:185p.

Baseline studies were conducted on adult and juvenile chinook salmon in the Nechako River to assess their abundance, distribution, movements and habitat requirements. These studies were initiated in response to the requirement for additional water from the Nechako River as proposed by the Aluminum Company of Canada (Kemano Completion Project). Data include spawner counts and adult biological characteristics, timing of egg development, timing and magnitude of downstream fry migration, distribution of rearing fry, and their diet, growth rate and food supply. Some analysis of the relationship between habitat and streamflow is also provided.


Key words: Nechako River, adult and juvenile chinook salmon.


## RÉSUMÉ

Russell, L.R., K.R. Conlin, O.K. Johansen and U. Orr. 1983. Chinook salmon studies in the Nechako River: 1980, 1981, 1982. Can. MS Rep. Fish Aquat. Sci. 1728:185p.

On a mené des études fondamentales sur les saumons quinnats adultes et juvéniles de la rivière Nechako afin d'évaluer leur abondance, leur répartition, leurs déplacements et leurs besoins en habitats. Ces études ont été amorcées en réponse au projet de parachèvement de la Kemano, présenté par l'Aluminum Company of Canada Ltd. Cet aménagement hydroélectrique comprend la dérivation d'un volume d'eau additionel de la rivière Nechako.

L'étude comprend les données suivantes: nombre de quinnats reproducteurs, caractéristiques biologiques, rythme de développement des oeufs, synchronisation et importance de la dévalaison chez les alevins, répartition des alevins d'élevage, nourriture, source d'aliments et taux de croissance. Le rapport présente aussi certaines analyses de la relation entre l'habitat et le débit du cours d'eau.


Mots-clés: la rivière Nechako, les saumons quinnats adultes et juvéniles.

# INTRODUCTION

In December 1950, the Aluminum Company of Canada Limited (Alcan) was granted a conditional water licence, permitting them to store, divert and use water from the Nechako River upstream of Cheslatta River and all waters of the Nanika River watershed upstream of Glacier Creek, approximately 5 km below Kidprice Lake (Fig. 1). As a condition of the license, the water was to be used for storage and power generation.

The company proceeded to develop the power generation facilities in two stages. The first stage, known as Kemano I, was constructed and operating by 1957. Construction of this stage included the Kenney Dam located at the Grand Canyon on the Nechako River, the Skins Lake Spillway, and a 16 km long tunnel conveying the water from the 906 $km^2$ reservoir created behind the Dam and Spillway to a powerhouse at Kemano (Fig. 1).

In the early 1970's, the B.C. Energy Board considered developing the unused generation capacity licensed to Alcan. This proposal, known as Kemano II, never proceeded to the development stage. Just recently, however, Alcan did announce their intentions to proceed with their second or Kemano Completion Stage of development. The details of this proposal are at the time of this writing under review by the Department of Fisheries and Oceans (DFO).

All the rivers that are affected by the existing and the proposed Kemano Completion development support significant populations of Pacific salmon and steelhead trout. Accordingly, the DFO has been concerned with the protection of these inherent fisheries resource values since the Kemano I project was first proposed. In 1950, the lack of adequate biological and physical data for the affected rivers made it difficult for the DFO to provide specific advice as to the measures necessary to adequately protect the fisheries resource values. Consequently, biological field studies on the Nechako River were conducted by this Department and the International Pacific Fisheries Commission from 1951 to 1953, and these studies led to the development of a series of recommended fish protection measures.

In 1974, the B.C. Energy Board Kemano II proposal identified the need for further biological and physical investigations on the Nechako, Nanika and Morice Rivers. Studies on these rivers were conducted between 1974 and 1975 and led to the development of additional fish protection recommendations (Dept. Fish. Env. 1979a).

In November 1979, while Alcan's consultants were engaged in further biological and physical investigations on the Nechako River in support of their Kemano Completion proposal, Alcan reduced the flow releases from Skins Lake Spillway such that the low volume of water in the Nechako River seriously threatened the survival of the incubating chinook salmon eggs deposited in the gravel. The Minister of Fisheries and Oceans, under authority of the Federal Fisheries Act, requested Alcan to increase the flows to specified levels. Alcan resisted and the Department applied for, and obtained a Supreme

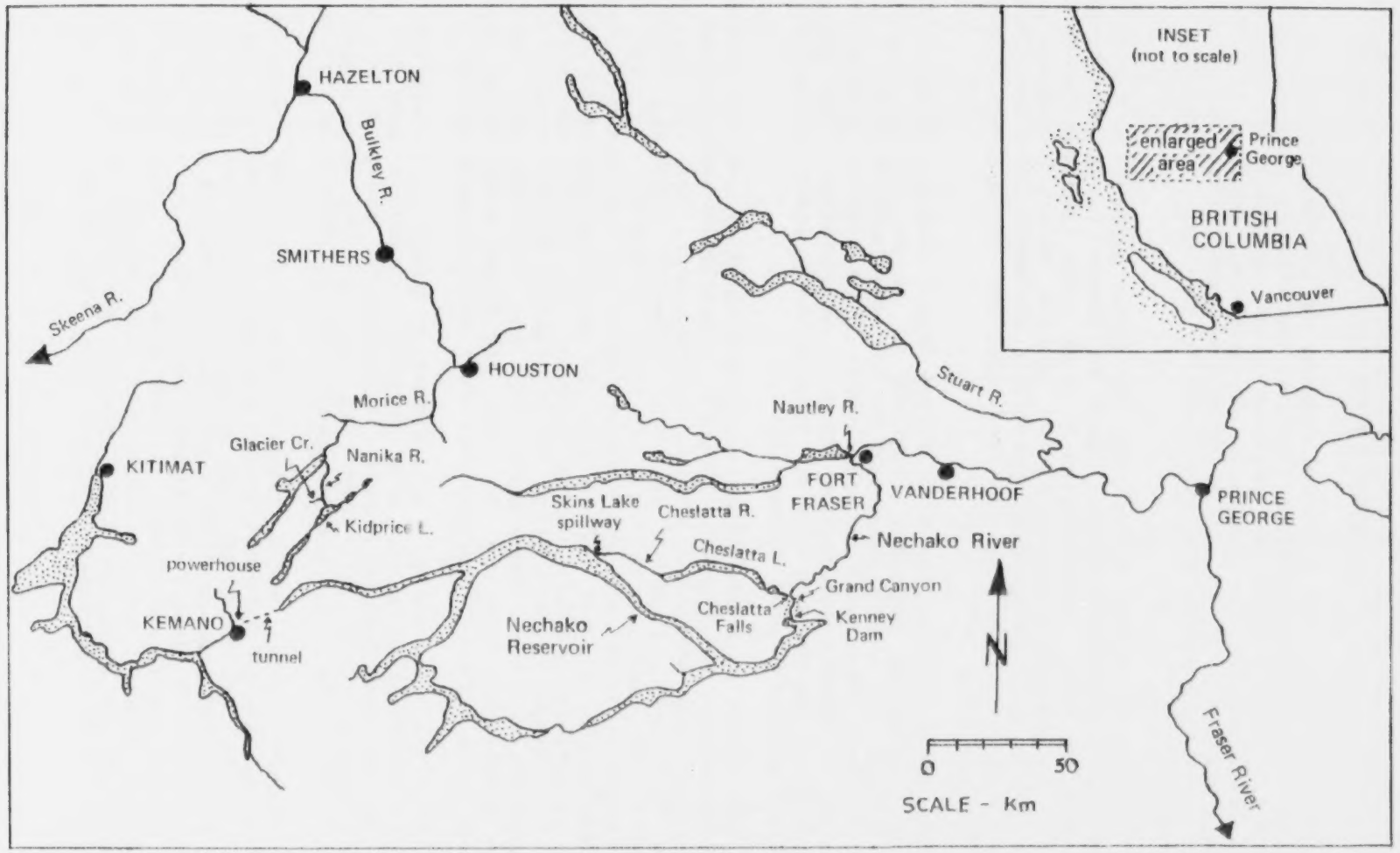



Fig. 1. Nechako Reservoir area.

Court injunction ordering Alcan to comply with the Minister's instruction. The application for injunction was supported by an affidavit of provisional information. It was recognized that additional biological and physical data were required, and appropriate field studies were designed and conducted.

This report presents the data collected from the most recent three years of study on the Nechako River. The habitat requirements for incubating and rearing chinook salmon were the focus of the studies. Some of the data were collected in close collaboration with Alcan's consultants. Data provided by consultants employed by the DFO and by Alcan are acknowledged in the report. Information presented here will be used by the DFO for the development of its response to the proposed Kemano Completion project.

## STUDY OBJECTIVES

The 1980, 1981 and 1982 DFO studies on chinook salmon in the Nechako system had the following objectives:

1) determine the abundance, distribution and downstream migration timing of chinook juveniles in the Nechako system;

2) determine juvenile chinook growth rates and their diets;

3) determine the type and abundance of potential juvenile chinook food sources by sampling the Nechako benthos and drift;

4) assess changes in the rearing habitat area at different flows;

5) estimate annual escapements of chinook adults, and determine their spawning timing and distribution, age composition, length, weight, fecundity and egg retention;

6) determine egg development rates, and the effect of winter temperatures and depth of egg planting on egg-to-alevin survival;

7) provide additional data to assess flow requirements for spawning chinook salmon including depth and velocity criteria at actual redds.

# METHODS

## CAPTURE OF CHINOOK JUVENILES 1980

### Beach seining

Beach seining on the Nechako mainstem was conducted between May and November at 26 sites between Cheslatta Falls and the Stuart River confluence (Fig. 2) using a 15 m x 2 m marquisette net carried in a helicopter when river flows were low (11.3 - 22.7 $m^3$/sec.; 400 - 800 cfs) and using a 25 m x 2 m (1 cm stretched mesh) net worked from

Fig. 2. Juvenile chinook capture sites on Nechako mainstem, 1980.

a riverboat at discharges greater than 22.7 $m^3$/sec (800 cfs). Two sets were made at each seine site on each sampling date. All captured fish were identified and counted.

Fyke net trapping

A fyke net (mouth opening 0.5 m x 0.5 m; 0.5 cm and 1 cm stretched nylon mesh funnelling into a 10 cm ID ABS pipe emptying into a 0.5 m x 0.5 m x 1 m baffled aluminum livebox) was installed on an outside bend of the Nechako mainstem below a riffle area just upstream of Swanson Creek (Fig. 2) on July 14. The trap was fished continuously until July 19 when it was removed for repairs.

Inclined plane trapping

A 0.5 m x 0.9 m expanded aluminum mesh inclined plane trap was installed on the Nechako mainstem near beach seine site No. 3 (Fig. 2) on July 14. Two leads (1 m x 5 m) were constructed of 5 cm x 10 cm lumber and 0.5 cm galvanized mesh and placed upstream of the inclined plane trap to lead fish moving downstream along the south bank of the mainstem Nechako into the trap. The gear was fished continuously from July 14 to 19 and was cleaned daily to prevent debris accumulation.

Fence trapping

Two fence traps, one fishing upstream and one fishing downstream, were installed near the mouth of each of Greer and Cutoff Creeks (Fig. 2) in September to monitor movement of chinook juveniles into and out of the tributaries during the fall. The traps were constructed of plywood, 5 cm x 10 cm lumber and 0.5 cm galvanized mesh using the dimensions cited by Armstrong and Argue (1977).

The traps in Cutoff Creek fished the whole streamflow while those used in Greer Creek fished approximately one-half of the flow. The trap and leads in Greer Creek were installed from the east bank to a sandbar in mid-channel where the stream, flowing at approximately 0.6 $m^3$/sec (20 cfs), divided in two.

The trap at Cutoff Creek operated from September 7 until freeze-up (November 25) and was checked every 2 days throughout September and early October. After October 2 the trap was examined approximately every two weeks. The Greer Creek trap was installed September 5 and was checked approximately every two days until it was removed on October 6. All trapped fish were identified, counted and released.

Electroshocking

A Smith-Root type VII electroshocker was used from June to November in several Nechako tributaries (Fig. 3). All streams with flowing water between Cheslatta Falls and Vanderhoof were surveyed in July and October, and all streams between Vanderhoof and the Stuart River confluence were surveyed in July to determine the length of streams accessible to salmon. These data were used to estimate juvenile salmonid populations in the surveyed tributaries.

Fig. 3. Juvenile chinook electroshocking sites on Nechako tributaries, 1980.

A 20 m to 30 m section of each stream sampled was isolated with stop seines and all fish electroshocked in three successive passes through the stream section were removed, identified, counted and subsequently released. An estimate of fry density in each 30 m stream segment was calculated according to the methods of Cross and Stott (1975). Total stream population estimates were derived by relating calculated fish densities in each 30 m segment to total stream length accessible to fish.

Snorkelling

Ten 1000 m sections of the Nechako mainstem between Cheslatta Falls and the Nautley River confluence (Fig. 4) were surveyed between June and September by three or four divers. Divers swam abreast downstream and recorded on underwater slates all fish sighted and their position relative to the river substrate. In some cases, feeding behaviour or schooling activity of fish was determined when divers were able to hold in the current by grasping boulders or debris. A composite record of diver observations including fish species sighted and behavioural activities noted was prepared following each survey.

CAPTURE AND MARKING OF CHINOOK JUVENILES 1981

Juvenile capture

In the spring of 1981, five fyke nets and four 2x3 inclined plane traps were installed in the upper Nechako mainstem above the Cutoff Creek confluence by DFO and Envirocon Ltd. (Figs. 5-9, Appendix 1). The traps fished from March or April to May. Captured fish were identified and counted and all chinook juveniles were held in holding pens for spray-marking with fluorescent grit.

Some of the above traps were operated again during June and September (Appendix 1) to determine chinook presence. All chinook juveniles captured at that time were counted and scanned for fluorescent marks.

One converging throat fence panel trap was installed by Envirocon Ltd. on the Nechako mainstem below Diamond Island near Smith Creek (Fig. 5). The trap consisted of screened (1/2 cm hardware cloth mesh) fence panels nailed together and converging into troughs and then into live boxes. Two separate V-shape configurations were installed, trapping approximately 7% (Envirocon 1982) of the downstream flow (Figs. 10 & 11). The trap fished between May 18 and July 16 when it was removed to avoid wash out by high streamflows (flow increase was requested by DFO to reduce water temperature for sockeye spawners).

One 4x4 inclined plane trap was installed by Envirocon Ltd. on the lower Nechako mainstem at Prince George just above the Fraser River confluence (Fig. 5) and fished between June 13 and August 24. The trap was suspended from an old single lane bridge crossing the Nechako River. To augment the catches and trap the inshore areas, a 2x3 inclined plane trap was also installed at this location and fished

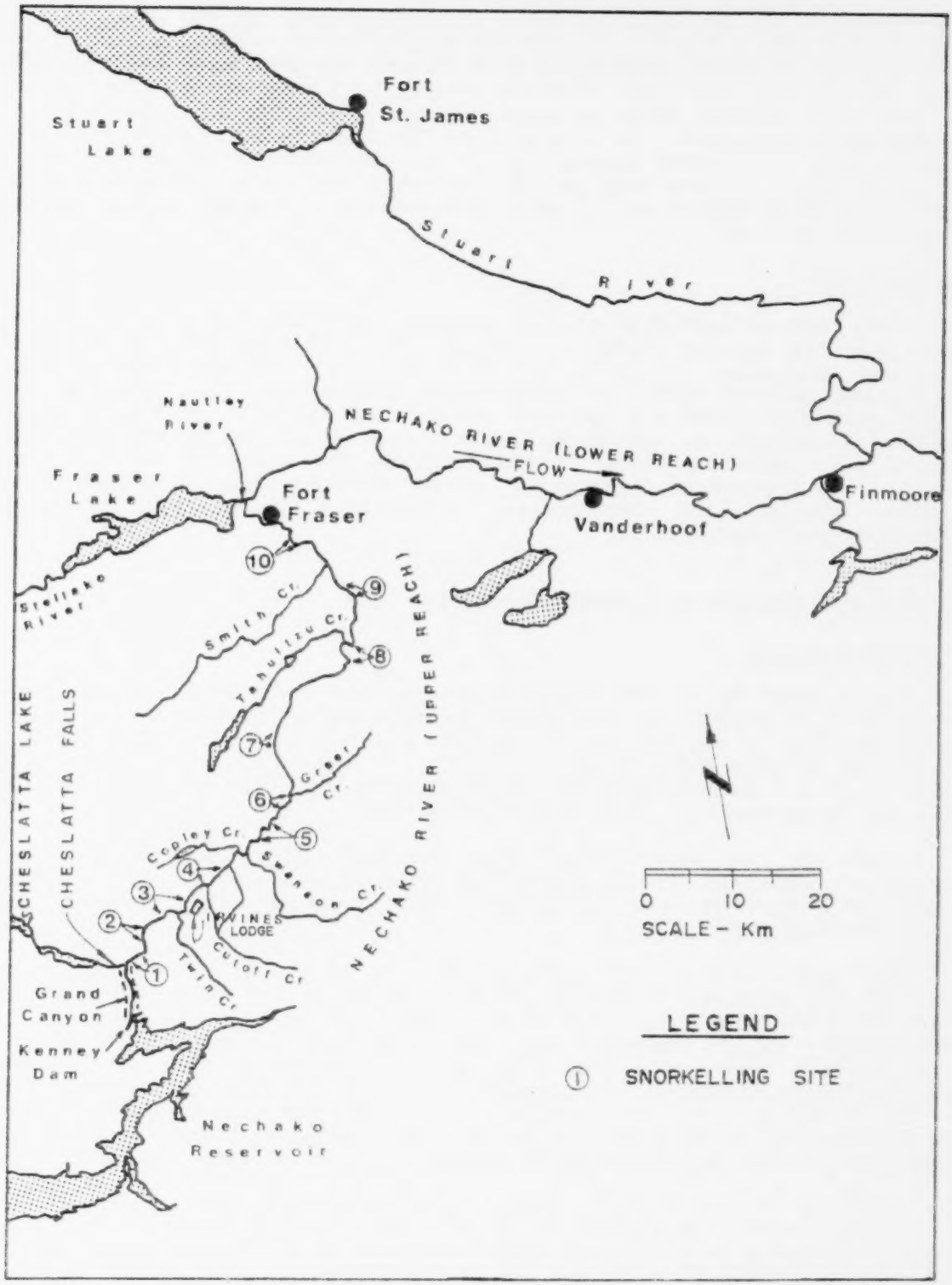



Fig. 4. Snorkelling sites, Nechako River, 1980.

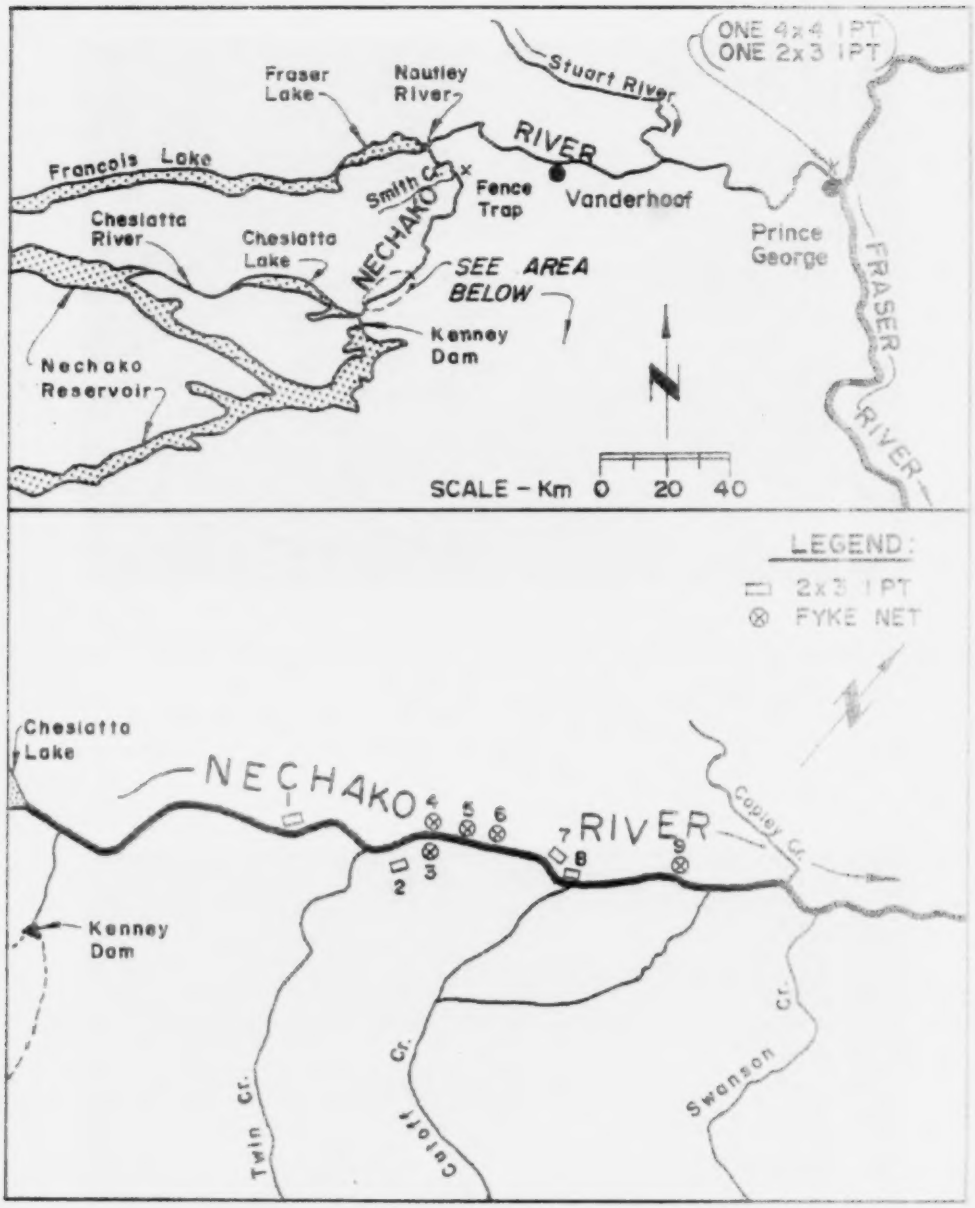



Fig. 5. Location of juvenile chinook capture sites on Nechako River, 1981 (sketch below shows detail of upper Nechako River trap locations).

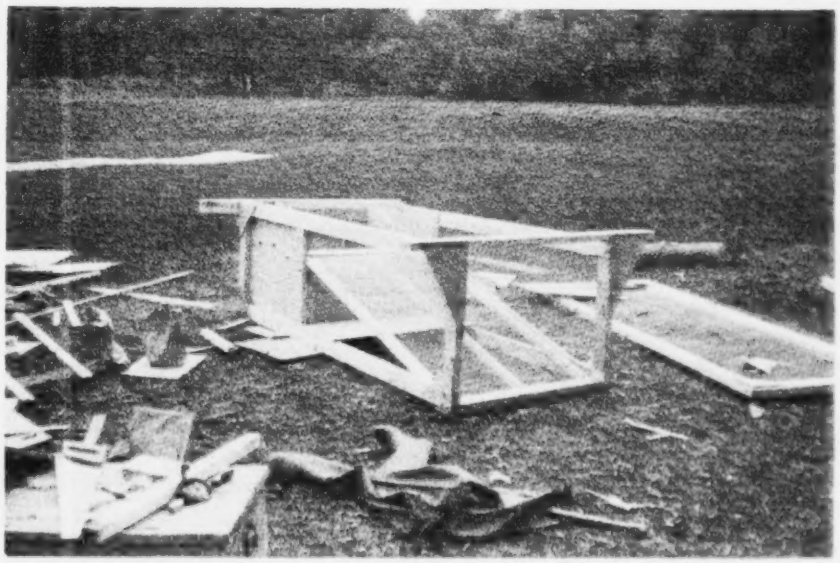


Fig. 6. Wooden 2x3 inclined plane trap, Nechako River, 1981.

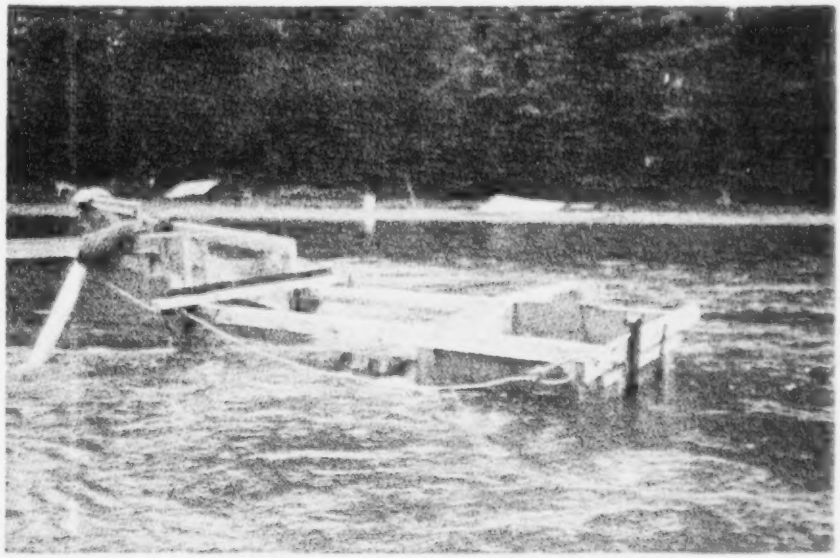


Fig. 7. A 2x3 inclined plane trap in fishing position, Nechako River, 1981 (note fence wings to increase the catches).

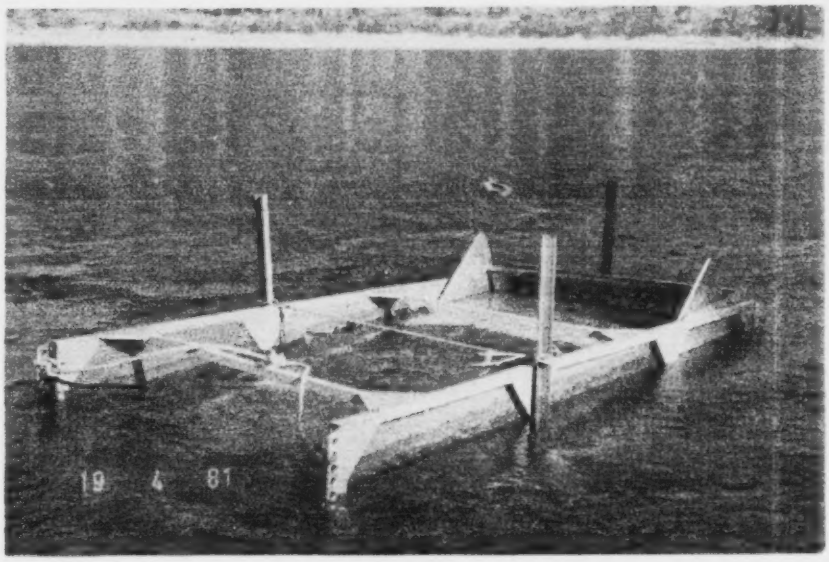



Fig. 8. Metal 2x3 inclined plane trap installed above Cutoff Creek, 1981.

Fig. 9. Fyke net fry trap and live box, Nechako River, 1981 (note fence sections added to increase the catch).

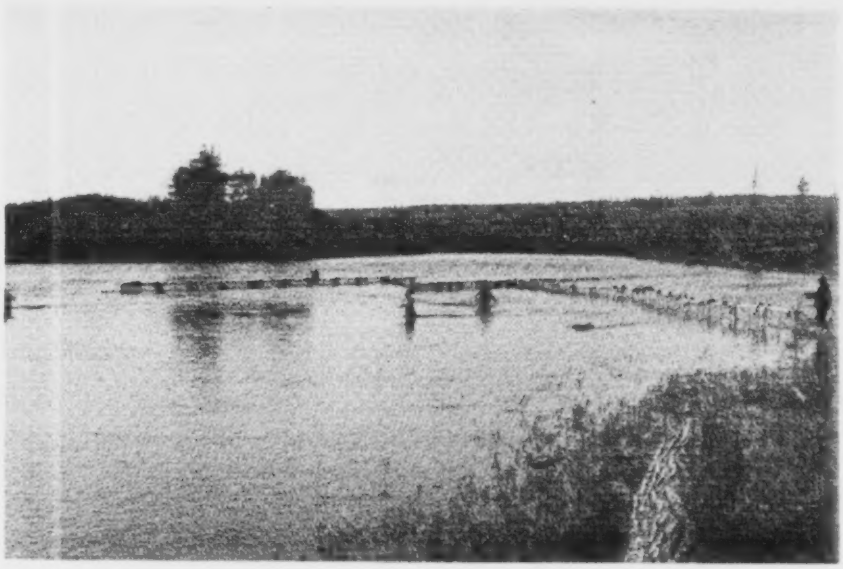


Fig. 10. Diamond Island fence trap, Nechako River, 1981.

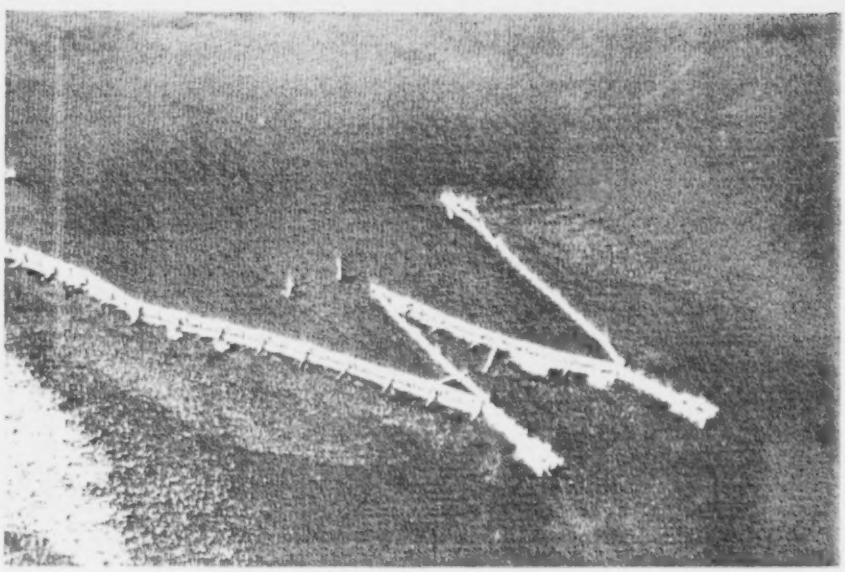


Fig. 11. Aerial view of Diamond Island fence trap, Nechako River, 1981.

between June 18 and August 24. All captured fish were identified and counted.

Juvenile marking and recovery

During the 1981 spring juvenile capture program, Envirocon Ltd. conducted a chinook marking study using fluorescent grit and following standard marking techniques (Phinney, Miller and Dahlberg 1967; Healey, Jordan and Hungar 1976) (Figs. 12 & 13). Marked fish were revived and held in floating pens to determine mortalities and establish accurate counts. Daily mark retention was determined by mixing 20 unmarked fish with an unknown sample size of fish marked that day (approximately 100). The daily mark retention was derived by counting unmarked fish in the sample, and subtracting the 20 unmarked control fish. The actual sample size was then counted and the percentage of fish retaining the mark calculated. This system also acted as a check against interobserver variability and error in detecting marks.

To determine long-term mark retention, an experiment with 1,718 marked chinook was carried out. The marked fish were reared in a separate holding pen for approximately three months and periodically examined with ultraviolet lights to detect fluorescent grit marks.

Three different colours were used to spray-mark the Nechako mainstem chinook. Red was used to mark juveniles captured in the upper mainstem upstream of Cutoff Creek; marks were released just below Twin Creek (Fig. 5). Orange and green pigments were used to mark fish captured downstream in the Diamond Island fence trap. The orange-coloured fish were released upstream of the fence trap while the green-coloured fish were released downstream; the latter to determine whether any upriver migration occurred. (As a separate experiment, salmonids were marked with green pigment and released upstream of trap No. 1 (Fig.5 ) to calibrate all the upper river traps). All marked fish were released at dusk.

To assess the downstream progress of spray-marked chinook fry, electroshocking and beach seining were conducted by Envirocon Ltd. on selected tributaries and throughout the Nechako mainstem (Fig. 14) from May 29 to October 10, 1981. All captured chinook juveniles were scanned with ultraviolet light for detection of fluorescent marks. The number of recaptured marks was then compared to the total chinook catch at each trap.

SAMPLING OF CHINOOK JUVENILES 1980, 1981

In 1980, a maximum of 10 chinook juveniles captured at each site on each sampling date using beach seines in the mainstem and electroshocking in the tributaries were preserved in 5% formalin and measured for nose-fork length (± 1 mm) and wet weight (± 0.1 g), then analyzed in the laboratory for stomach contents; fish were transferred to 50% isopropyl alcohol prior to identification of stomach contents. All chinook juveniles captured using fyke net and inclined plane trap were measured for nose-fork length (± 1 mm) and released.

Fig. 12. Anaesthetized chinook juveniles placed on screened tray for spraying, Nechako River, 1981.

Fig. 13. Chinook juveniles sprayed with fluorescent grit, Nechako River, 1981.

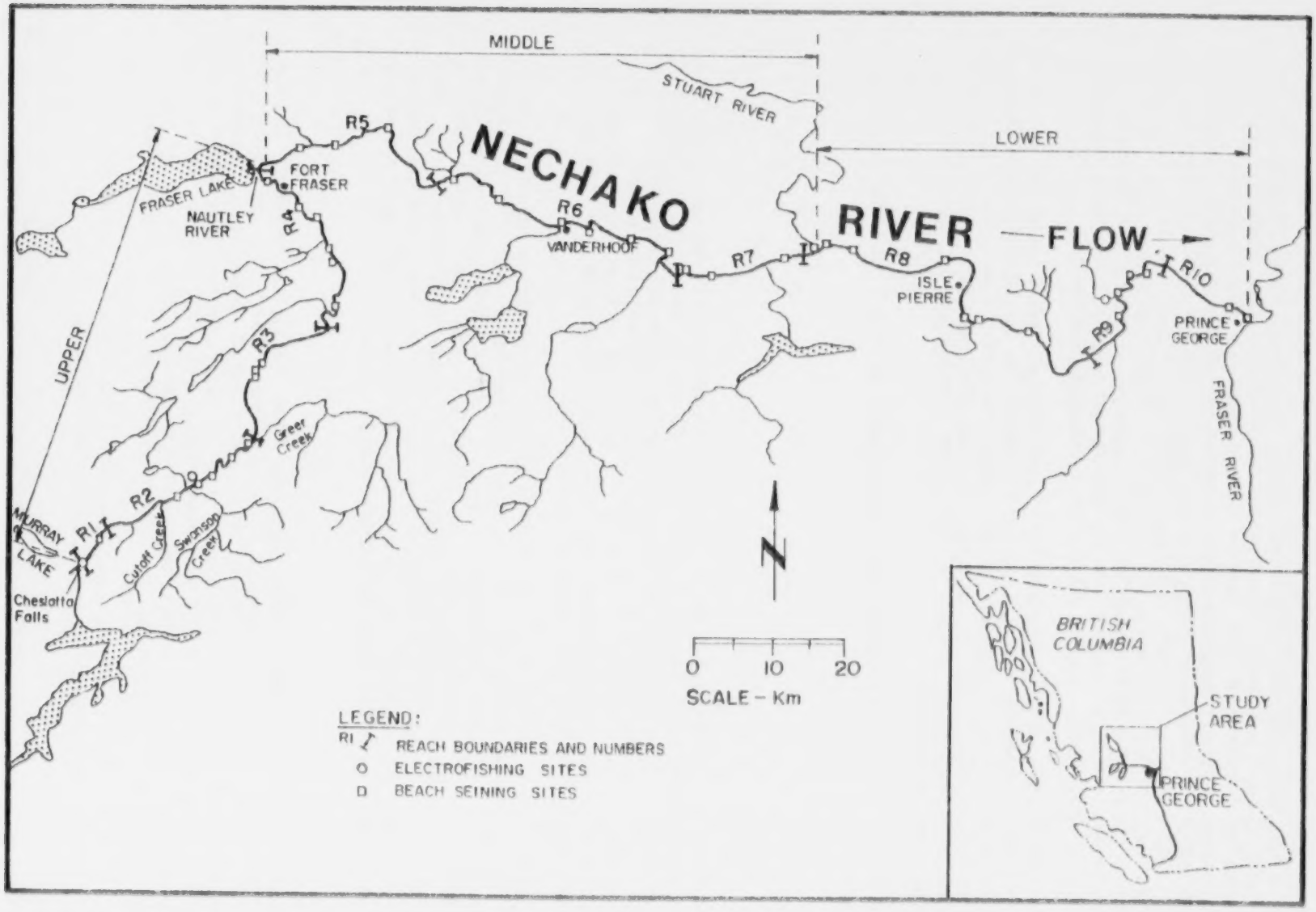



Fig. 14. Beach seining and electroshocking sites sampled during mark recovery, Nechako River, 1981 (sampling sites and reach designations established by Envirocon Ltd.).

In 1981, chinook fry captured using inclined plane traps, beach seines and fyke nets were subsampled throughout the capture period (n = 5-50) and measured for length and weight as described for 1980. Stomach contents were analyzed for a maximum of 31 chinook juveniles captured on each sampling date between April and September/October at 1500 to 1700 hours at beach seining sites No. 3 and No. 11 (Fig. 2); these sites were concurrently sampled for benthos and drift. Subsampled fish were preserved in 80% isopropyl alcohol and shipped to the DFO benthic laboratory in West Vancouver where they were weighed and measured as above, and analyzed for stomach contents.

In 1981, scales of chinook fry and smolts were sampled at the inclined plane trapping site at Cutoff Creek in April, May and June; and at seining and trapping sites near Cutoff Creek in July and September (Fig. 5). All fish sampled for scales were also measured for nose-fork length ($\pm$ 1 mm). Scales were analyzed in the DFO scale laboratory in Vancouver.

The juvenile sampling study was conducted jointly by the DFO and Envirocon Ltd.

## BENTHIC SAMPLING

### 1980

Benthic invertebrates were sampled from riffle areas (flow 30 cm/sec, depth 30 cm or less, gravel size 10 cm or less) near selected beach seining sites on the Nechako mainstem between Cheslatta Falls and the Stuart River confluence, and at electroshocking sites in the Nechako tributaries (Figs. 2 and 3). Sampling was conducted during June, July, August and November and the dates generally coincided with the sampling dates for fish stomach contents.

Samples were collected by scraping and dislodging gravel in a 0.1 $m^2$ area to a depth of 10 cm into a Wisconsin net (50 cm mouth diameter, 77 um mesh collection bag). Organisms collected were preserved in 5% formalin and shipped to the DFO invertebrate laboratory in West Vancouver where they were transferred to 60% isopropyl alcohol and stained with Rose Bengal to facilitate sorting. Organisms were identified to family level and genus or species where feasible. Exuviae were excluded from sample counts.

### 1981

Benthic invertebrates were sampled from April to October in the upper Nechako River at two sites selected for the presence of accessible pool, riffle, run and deep mid-channel habitats; proximity to chinook rearing areas; and similarity of substrate. The upper site was located approximately 11 km downstream from Cheslatta Falls and corresponded to the 1980 beach seining site No. 3 (Fig. 2). The lower site was located adjacent to the Diamond Island and corresponded to the 1980 beach seining site No. 11 (Fig. 2). Benthic sampling dates generally coincided with the sampling dates for fish stomach contents. Benthic sampling strategy is summarized in Table 1.

Table 1. Benthic sampling strategy at sites No. 3 and No. 11, Nechako River, 1981 (X indicates that sampling was done).

| Date | Site No. 3 | | Site No. 11 | |
|---|---|---|---|---|
| | Mundie Sampler[a] | Galen Sampler[b] | Mundie Sampler[a] | Galen Sampler[b] |
| April 26 | - | X | - | - |
| " 27 | X | - | - | - |
| " 28 | - | - | X | - |
| " 29 | - | - | - | X |
| June 3 | X | X | - | - |
| " 4 | - | - | X | X |
| July 20 | X | - | - | - |
| " 21 | - | X | - | - |
| " 22 | - | - | X | X |
| Sept. 29 | X | - | - | - |
| " 30 | - | X | - | - |
| Oct. 1 | - | - | X | - |
| " 2 | - | - | - | X |

[a] Sampled pool, riffle and run habitats.

[b] Sampled in mid-channel, 1/4 channel and nearshore areas; but no nearshore samples taken on Sept. 30 (site No. 3) or Oct. 2 (site No. 11).

Two types of samplers were chosen to accommodate the range of depths and velocities encountered. A Mundie sampler (Mundie 1971; Fig. 15) was used for sampling in water less than 45 cm deep; a Galen suction sampler (Fig. 16) was used for depths greater than 30 cm. The Mundie sampler was modified to enclose an area of 0.228 $m^2$ while the Galen gear sampled an area of 0.164 $m^2$. Both samplers utilized 250 um "Nitex" mesh collection bags. The relative sampling efficiencies of the two gear types were comparable and the evaluation techniques used are discussed in Appendix 2.

Shallow areas at sites No. 3 and No. 11 were divided into three habitat types: pools (negligible flow, flat water), riffles (fast flowing, breaking water) and runs (fast flowing, flat surface water). Within these three habitats, a Mundie sampler was placed on the substrate and oriented into the current. Large cobbles were removed by hand and washed in a bucket to remove attached organisms. The substrate within the sampler was agitated to a depth of 10 cm allowing the current to carry organisms into the sampling bag. All collected organisms were preserved in 80% isopropyl alcohol.

Four replicates were taken within a pool, three in a riffle, and three in a run. All replicates in the riffle and run and two replicates in the pool were from similar gravel/cobble substrate. The remaining pool replicates were from mud/silt substrate. Each replicate sampled an area just upstream from the preceeding one.

A Galen suction sampler operated by a SCUBA diver was used to collect replicate benthic samples in deep mid-stream areas of the river where the Mundie sampler could not be used. A 2 cm diameter polypropylene rope was secured to a tree on opposite banks of the river to allow the positioning of a riverboat downstream from each nearshore sampling site. At each of three positions along the rope (mid-channel, 1/4 channel and nearshore) the Galen sampler was lowered overboard onto the substrate. A SCUBA diver placed the sampler over the area to be sampled and, gaining access via the flaps at the top of the sampler, agitated the rocks and cobbles enclosed to a depth of 10 cm. A battery-powered bilge pump mounted on the sampler was activated and its nozzle was directed to entrain suspended invertebrates which were drawn into the sampling bag. All collected organisms were preserved in 80% isopropyl alcohol.

Three replicates were taken with a Galen sampler at each of the sampling sites (mid-channel, 1/4 channel and nearshore) along the transects at river sites No. 3 and No. 11. Each replicate sampled an area of similar substrate just upstream from the preceeding one.

The collected organisms were stained with Rose Bengal to facilitate sorting. All macrofauna (retained on a 1 mm mesh sieve) were counted and identified to family level where feasible. Microfauna were subsampled with a Folsom plankton splitter using the methods of McEwen et al. (1954), to a fraction containing not less than 100 organisms. The effects of this subsampling on the abundance estimates of microfauna are discussed briefly in Appendix 3.The microfauna were sorted and identified in the same manner as the macrofauna. Counts from the macrofauna and the microfauna fractions

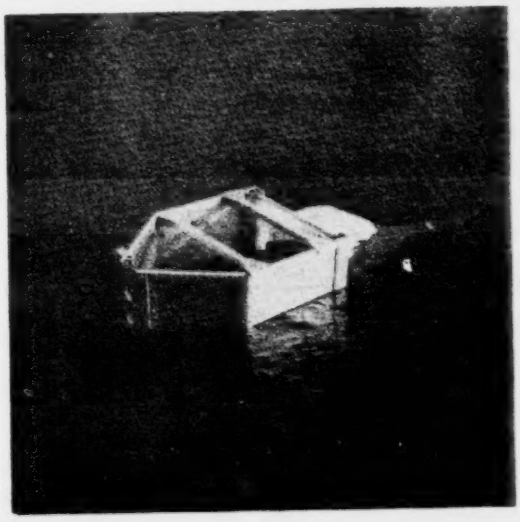


Fig. 15. Mundie sampler.

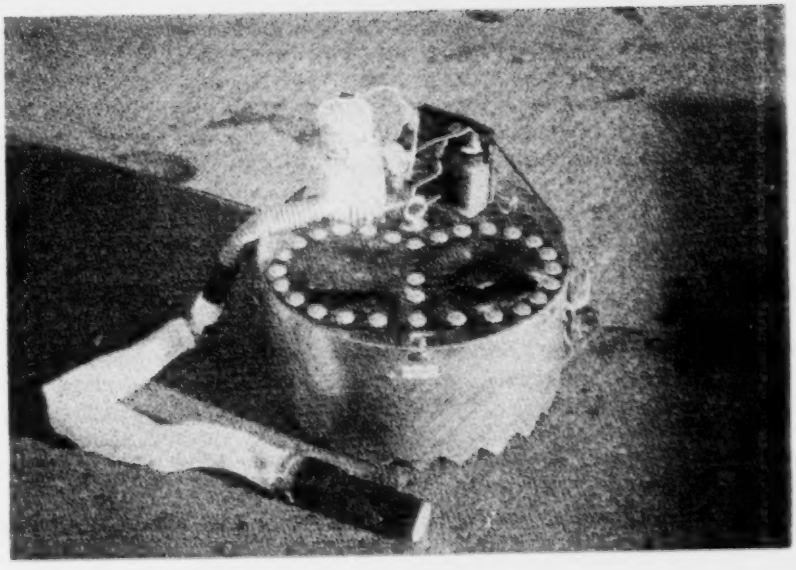


Fig. 16. Galen sampler.

for each sample and gear type were expressed as numbers of organisms per $m^2$ for each type of organism and size class.

For biomass determination only the macrofauna were used. Since the emphasis of the study was on potential fish prey, organisms in shells (Gastropoda and Eulamellibranchia) were removed from the macrofauna before weighing. The remaining organisms were measured for volume by water displacement, and for wet and dry weights (samples were dried at 102°C for 8 hours). Results were expressed as ml water displaced and grams per $m^2$.

Physical sampling at benthic sites 1981, 1982

During benthic sampling in 1981, water depth, water velocity (nose velocity measured at 12 cm depth above substrate using a Marsh/McBirney electronic current meter) and water temperature were recorded for each sample collected.

In 1982, substrate composition at each of the pool, riffle, run and nearshore benthic sites sampled in 1981 on the Nechako River was measured using an acetone dry ice freeze-core gravel sampler. The probe of the sampler was driven approximately 15 cm into the gravel at each site. Acetone and dry ice were added to the cooling chamber and allowed to stand for 15 minutes. At the end of this period the probe with the attached doughnut of ice and gravel was lifted out of the substrate and transferred to a plastic bag for shipment to the Vancouver DFO benthic laboratory for analysis. Freeze core gravel samples were not taken from mid-channel sites because water depth precluded use of the sampler.

The collected gravel samples were placed in a large shallow pan at room temperature until dry. The substrate was then passed through a series of 10 sieves with mesh sizes ranging from 38.1 mm to 63 um. The mesh size of each sieve in the series was one half the size of the sieve preceeding it. The particle size scale used for the analysis is shown in Appendix 4. The volume of substrate retained on each sieve was determined by water displacement and the percent volume of each particle size fraction in the total sample was calculated.

DRIFT SAMPLING

1980

Drift samples were collected using a Miller sampler (fibreglass cylinder 80 cm in length with a mouth opening of 10 cm and a 77 um pore opening bag) positioned parallel to the streamflow in 50 cm of water approximately 3/4 of the way under water (1/4 of the mouth opening protruded above the water surface to sample emerging insects). Sampling was conducted on June 28 for a period of one hour at beach seining sites No. 1 and No. 5; on July 16 to 19 for a period of approximately 12 hours at beach seining sites No. 1, 3, 5A and 11; and on August 8 to 9 for a period of approximately 25 hours at site No.3 (Fig. 2). The samples were treated as described for the 1980 benthos.

1981

Three drift samples were collected on each sampling date from April to October in each 1981 benthic riffle sampling area at sites No. 3 and No. 11 (Fig. 2). Drift samplers were installed alongside each other and secured to a T-bar so that their mouths (12 cm diameter) faced into the current and sampled from the surface down to a depth of 3 cm. Samplers were left in place for approximately 14 hours (1800-0800 hours) during each sampling period. The organisms collected were preserved in 80% isopropyl alcohol and the samples treated as described for 1980.

## REARING HABITAT ASSESSMENT 1982

### Survey of channel cross-sections

Sections of the Nechako River between Cheslatta Falls and Fort Fraser (Fig. 17) were surveyed using an engineer's level and transit in order to determine the effect of reduced discharge on the size of the suitable chinook rearing area within each surveyed section. Fourteen cross-sections were chosen to represent the various widths, depths, and multi-channeled and meandering configurations present in the river (Fig. 17). Each of the cross-sections was measured at regular intervals across the wetted width for water depth and mean velocity at several discharges between 36.8 $m^3$/sec (1300 cfs) and 70.8 $m^3$/sec (2500 cfs). Mean velocity was measured from the bottom at 40% x total depth. The available rearing area at each discharge and within each cross-section was then determined using the criteria that chinook fry utilize areas within the water column that are deeper than 15 cm and have an average velocity range of 0 to 40 cm/sec. These criteria for Nechako River chinook juveniles were generalized from Bovee (1978) and observations in the Nechako River.

### Aerial photographs and side channel evaluation

Aerial photo sequences were taken of the Nechako River between Cheslatta Falls and Diamond Island (Fig. 17), at river discharges of 11.6 $m^3$/sec (410 cfs), 25.2 $m^3$/sec (890 cfs) and 56.6 $m^3$/sec (2000 cfs). The photographs were analysed to determine the approximate changes in the length of wetted side channels at each flow. For the purpose of this analysis, the 15 photographed side channels were classified as follows (Fig. 18):

Class 1 - Permanent side channel distinctly separated from the mainstem by an island covered with well established vegetation.

Class 1B - Same as Class 1 except that through flow has ceased thus forming backwater channel.

Class 2 - Impermanent channel containing less than 25% of the total flow and separated from the mainstem by a gravel bar devoid of vegetation.

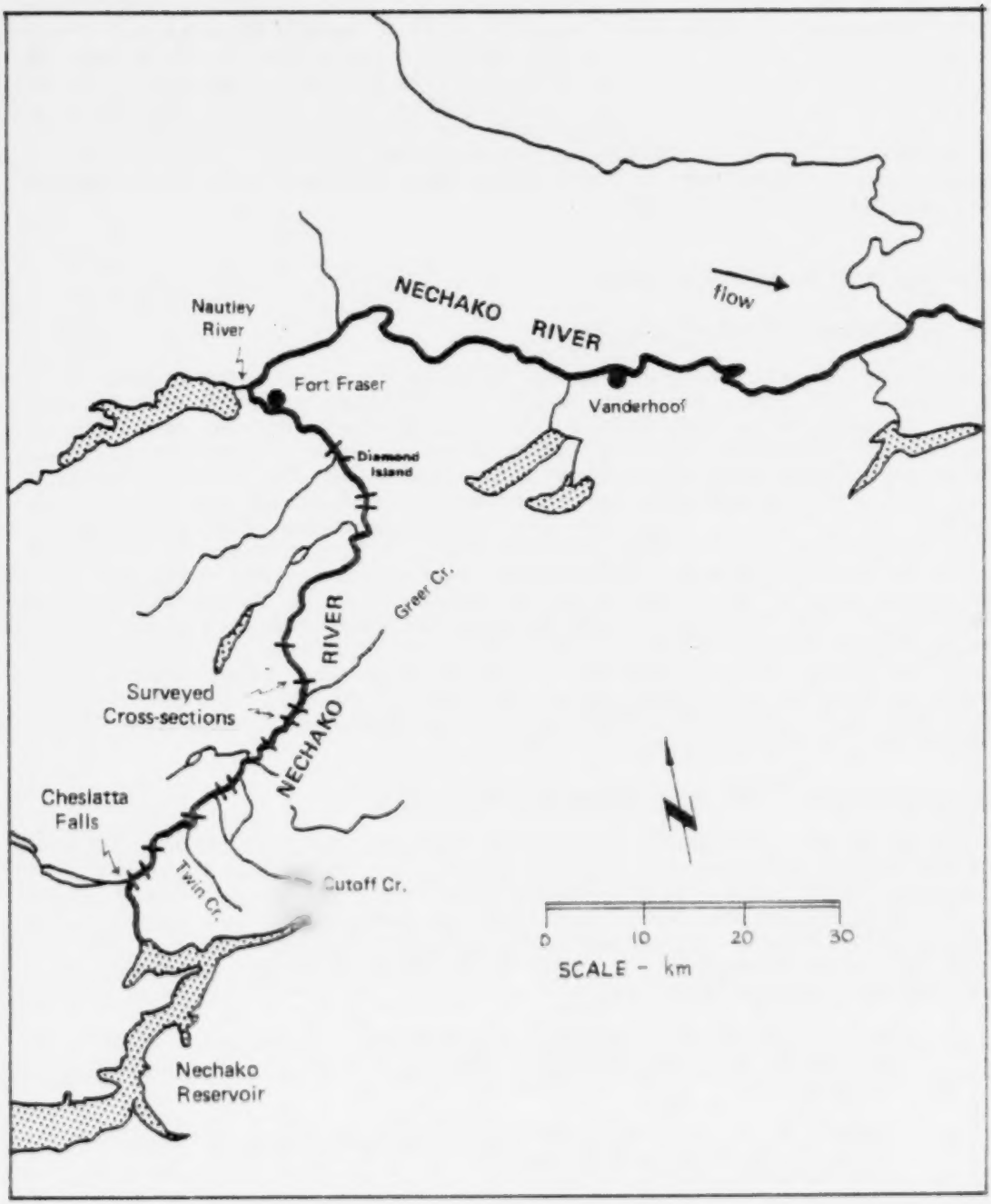



Fig. 17 . Location of 14 cross-sections surveyed for rearing habitat assessment, Nechako River, 1982.

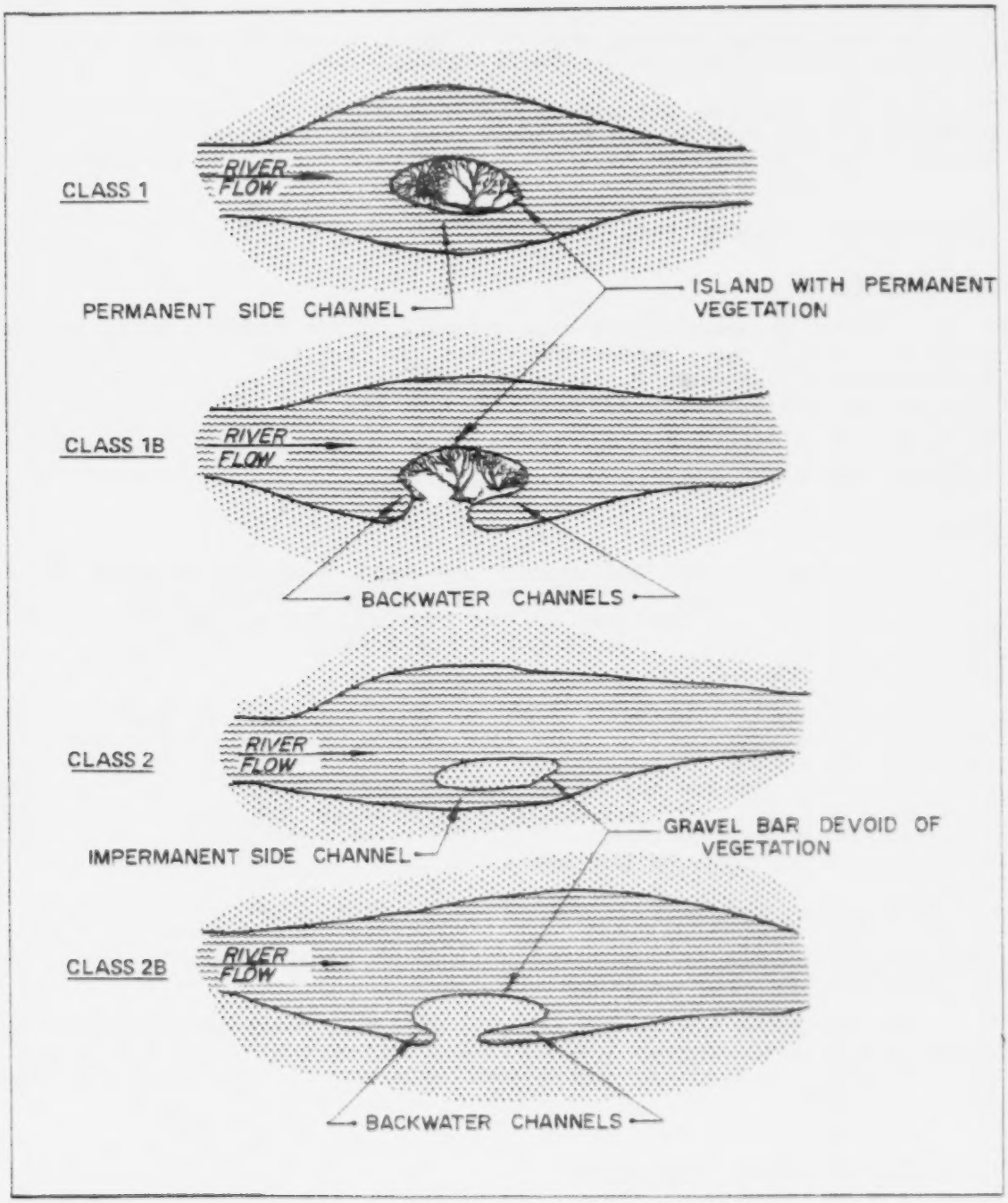



Fig. 18. Classification of side channels for evaluation of aerial photographs, Nechako River, 1982 (diagrammatic).

Class 2B - Same as class 2 except that through flow has ceased thus forming backwater channel.

In some cases, gravel bars in classes 2 and 2B became submerged at higher flows thus forming single channel flows.

For comparative purposes, the Nechako River between Cheslatta Falls and Fort Fraser was divided into four reaches and the total length of the above side channels within each reach was measured.

## ADULT CHINOOK SALMON 1980, 1981, 1982

### Aerial survey

In 1980, chinook adults were counted in the Nechako River between Cheslatta Falls and Vanderhoof (Fig. 2) by two observers from a helicopter on September 2, 9, 16 and 23. In 1981, adults were counted from a helicopter on September 17 and 24. In 1982, adults were counted from a helicopter on September 14 and 20. In all years, abundance and distribution of chinook spawners were recorded on 1:50,000 scale topographic maps.

### Adult sampling

In September 1980, 200 chinook spawners were dead-pitched in the Nechako River between Cheslatta Falls and Greer Creek (Fig. 2). All fish were sexed and measured to the nearest 0.5 cm for postorbital-hypural length and 21 fish (7 males, 14 females) were weighed to the nearest 0.25 kg.

Scale samples (one scale from the preferred area on both the left and right sides of the fish plus four scales taken at random from each side of the fish) were removed from each measured fish for age determination. Random scales were collected in addition to those from the preferred area because scale regeneration and damage are often evident in chinook spawners (Y. Yole, DFO, pers.comm.). All scale samples were analyzed in the DFO scale laboratory in Vancouver.

Fecundity and egg retention were determined by counting the number of eggs retained by unspawned and spawned females respectively. All dead-pitched fish were chopped in half to avoid re-examination.

In September 1981 and 1982, 179 and 200 chinook spawners respectively were sampled for age, sex, postorbital-hypural length and egg retention. Sampling techniques were similar to those described above for 1980.

## INCUBATION STUDIES 1980, 1982

### Physical measurements of spawned chinook redds

During the 1980 spawning period, the river discharge was

relatively constant at 34.0 $m^3$/sec (1200 cfs). In September, at each selected redd where spawning activity was observed, longitudinal profiles were obtained commencing in the undisturbed gravel immediately upstream of the redd, progressing directly downstream across the redd and terminating downstream of the crest of the dune or tailspill. Water depth over the actual redd was obtained by measuring water depth over undisturbed gravel immediately adjacent to a freshly dug redd area. Water depths were also observed at each point of measurement, and a single point velocity (nose velocity) was taken 12 cm above the bottom immediately upstream of the active redd. A total of 48 redds were surveyed in this manner. Twenty five redds were located in the upper prime spawning area and 14 in the lower prime spawning area (Dept. Fish. Env. 1979 b). The remaining nine redds were randomly selected from the numerous isolated redds observed in the mainstem between the lower spawning area and Greer Creek. A few active redds were also observed in areas where the water depth was approximately 1.5 m but these were not measured.

Egg plants

In 1980, chinook adults utilized for egg-takes were captured using tangle and gill nets in the Nechako mainstem just above the Cutoff Creek confluence (Fig. 2) during September 12, 14 and 17. For each of the three egg takes, one ripe female and two or three ripe males were utilized. Females were bled, then the eggs stripped into a pail. Milt was added to the eggs before, during and after egg stripping. The egg and sperm mixture was stirred gently, put aside for two to three minutes, then washed with river water and allowed to water-harden in a darkened pail for about 20 minutes.

The water-hardened eggs were transferred in aliquots of 130 to perforated (5.5 mm diameter holes) plastic boxes (12.7 cm x 11.4 cm x 5.1 cm) filled with gravel ranging in size from 1 cm to 2.5 cm (Figs. 19 & 20). The egg boxes were then planted at gravel depths of 4 cm, 15 cm and 30 cm in five artificially prepared and one naturally spawned chinook redd.

In addition to the above egg plants in 1980, 12 egg boxes were buried in gravel ranging in size from 1 cm to 10 cm in perforated plastic milk trays (40 cm x 40 cm) set in the river at a gravel depth of 20 cm in a flow of approximately 30 cm/sec. Six of the egg boxes which were relatively easy to remove for inspection were monitored for development at regular intervals. All egg plants were made in the upper Nechako River between Twin and Cutoff creeks (Fig. 2).

In 1981, no eggs were taken since the peak spawning period was missed due to turbid water conditions throughout September.

In 1982, chinook adults utilized for egg-takes were captured on September 16. Capture site and methods, as well as the egg-taking technique were similar to those described for 1980.

Fertilized, water-hardened eggs were transferred in 1982 in aliquots of 50 eggs to 61 perforated (5.5 mm diameter holes) plastic boxes (12.7 cm x 11.4 cm x 5.1 cm) filled with gravel ranging in size

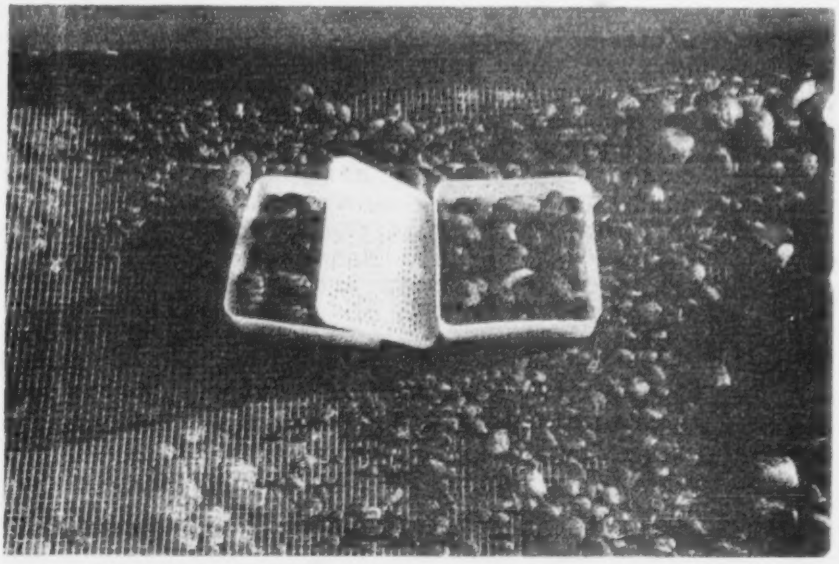


Fig. 19. Drilled plastic boxes with gravel, Nechako River, 1980.

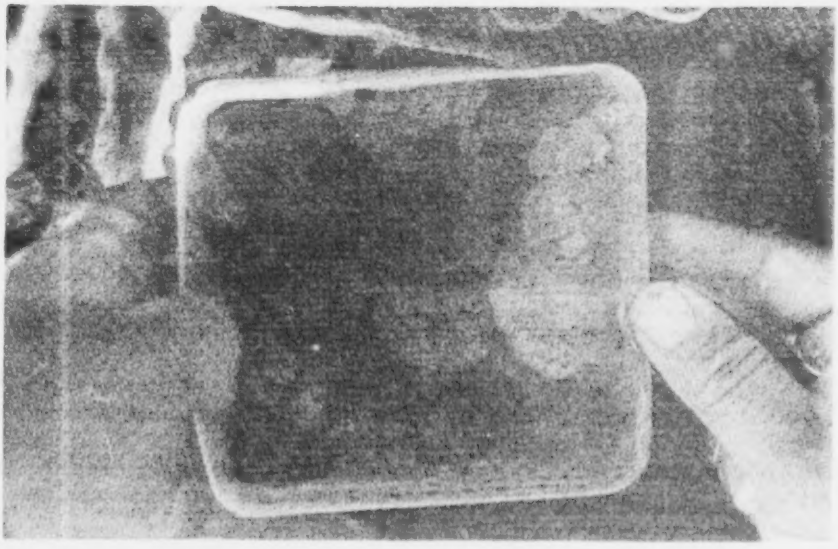


Fig. 20. Aliquots of 130 eggs placed in plastic boxes, Nechako River, 1980.

from 1 cm to 2.5 cm. The egg boxes were then planted in the river in seven artificial and natural redds at two different gravel depths (15 cm and 25 cm) and four different water depths (7 cm, 15 cm, 40 cm and 45 cm) (Table 2). The three types of redds tested (artificial - shallow; artificial - within criteria; and natural - within criteria) were based on the mean nose velocity and depth profiles obtained for natural redds measured in the upper Nechako spawning area in 1980 (Table 19). The redds "within criteria" were those that would remain submerged over the expected range of discharges while "shallow" redds would become exposed at a lower discharge.

In addition to the above egg plants, six Vibert boxes containing 50 eggs each were buried in 1982 in redd No. 2 below 5 cm of gravel; and four large perforated aluminum boxes containing 150 eggs each were placed on the river substrate and covered with gravel (two of the boxes had a gravel depth of 15 cm and two of 25 cm). The arrangement of these four boxes within the streambed is shown below:

| Box No. | Water depth before burial (cm) | Gravel depth over box (cm) | Water depth over gravel (cm) | Velocity at top of tailspill | |
|---|---|---|---|---|---|
| | | | | m/sec | (fps) |
| 1 | 40 | 15 | 20 | 0.3 | 1.1 |
| 2 | 40 | 15 | 20 | 0.3 | 1.1 |
| 3 | 75 | 25 | 30 | 0.9 | 3.0 |
| 4 | 75 | 25 | 30 | 0.9 | 3.0 |

Two additional plastic boxes containing eggs were buried in 1982 in the river gravel and removed after 24 hours to examine and record fertilization success and egg mortality.

During subsequent field trips undertaken on October 19, November 9 and November 25, 1982, two plastic boxes were removed from each redd to determine egg mortality, hatching success and downward migration of alevins into the gravel.

Temperature measurements

In 1980, river temperatures in the incubation study area (near Irvine's Lodge; Fig. 2) were monitored from September 1 using a Pulsar automatic recording thermograph. The thermograph malfunctioned temporarily in January and February 1981.

In 1982, continuous water temperatures were recorded within two artificial redds from the time of the egg plant on September 16 until February 23, 1983. Three probes were placed in an artificial redd, totally covered by water, at gravel depths of 10 cm, 30 cm and 40 cm beside egg plants which were located at depths of 15 cm and 25 cm. Probe No. 4 was placed in a very shallow artificial redd at a gravel depth of 10 cm adjacent to eggs planted at 15 cm gravel depth; the crest of this redd was exposed by approximately 5 cm. Probe No. 5 was used to monitor the ambient air temperatures.

Table 2. Egg planting strategy for different gravel and water depths, Nechako River, 1982.

| Redd No. | Redd type (cm) | No. egg boxes | Depth of gravel | Depth of water over redd tailspill |
|---|---|---|---|---|
| 1 | Artificial (shallow) | 10 | 15 cm | 7 cm |
| 2 | Artificial (shallow) | 10 | 25 cm | 15 cm |
| 3 | Artificial (within criteria) | 10 | 15 cm | 15 cm |
| 4 | Artificial (within criteria) | 10 | 25 cm | 45 cm |
| 5 | Natural (within criteria) | 10 | 15 cm | 45 cm |
| 6 | Natural (within criteria) | 10 | 25 cm | 40 cm |
| 7 | Artificial (shallow, exposed gravel) | 1 | 15 cm | Exposed tailspill |

Waterproof extension cables connected to the temperature probes were buried along the river bottom and up the river bank to prevent shifting ice from removing them. These cables were run to a central location on the bank and wired into the Pulsar thermograph.

Gravel sampling in redds

In 1980, gravel particle size in artificial and natural redds and depth of natural egg deposition were determined by inserting a bronze probe (2.5 cm O.D. x 1.5 m long) 30 cm to 40 cm into several areas of four spawned redds and freezing the gravel core by introducing pressurized carbon dioxide gas through a hose and pipe attached to an 18 kg fire extinguisher (Figs. 21 & 22). The pressure into the sampler was regulated so that a small jet of $CO_2$ escaped the exhaust port. The sampler was operated for 2 minutes per sample. All gravel samples were saved for particle size analysis and the number of eggs in each sample was recorded.

In 1982, two gravel samples were taken along the crest of an artificial redd to establish the proportion of fines compared to the natural redds. The freeze core sampling method used was similar to that described above for 1980.

## RESULTS AND DISCUSSION

### CAPTURE OF CHINOOK JUVENILES 1980

Beach seining

Beach seining results for May to November are summarized in Table 3. Detailed catch data are presented in Appendix 5. Catch per unit effort of chinook fry (No. fry/set) showed that large numbers of fish reared initially (May to June) in nearshore habitats adjacent to major spawning areas (sites No. 1 - 5A; Fig. 2). As the summer progressed, seine catches declined near the spawning areas and were relatively low at all sampling sites. In mid-July, larger catches of fish were evident near the Stuart River confluence (sites No. 22-24; Fig. 2) and probably consisted of Stuart River as well as Nechako River chinook fry. From August until November, fry catches were low throughout the river despite considerable seining effort. Water temperatures during beach seining increased from around 8°C in early May to around 18°C to 19°C during June through August (Appendix 5).

Trends in fry abundance similar to the above were observed in other Nechako River studies. Envirocon Ltd. (1981b) and Olmsted et al. (1980b) found that chinook fry were abundant in May and declined in June in 1980. In 1974 and 1979, this decline occurred in July (Dept. Fish. Env. 1979b; Envirocon 1981b). The decrease in seasonal abundance can be attributed to downstream migration, dispersal in the river and tributaries, and to natural mortality. It should also be noted that beach seining is a less efficient technique for sampling large, actively swimming fry compared to newly emerged fry.

Fig. 21. Carbon dioxide freeze-core sampler in operation on a salmon redd, Nechako River, 1980.

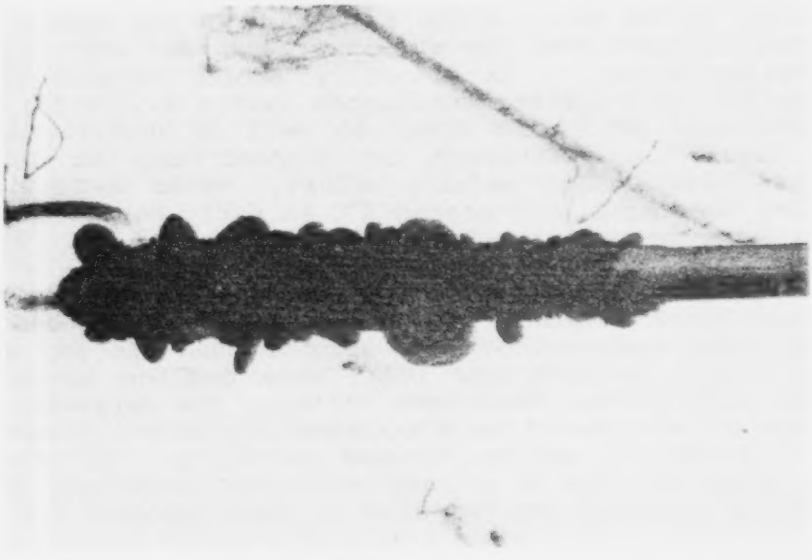


Fig. 22. Typical gravel sample after two minutes of operation, Nechako River, 1980.

Table 3. Catch per unit effort of chinook juveniles during beach seining, Nechako River, May - November 1980.

| Date | Sites | No. chinook fry/set |
|---|---|---|
| May 1 | 1-5A | 56.6 |
| June 24-28 | 1-5A | 15.8 |
| | 6-14 | 1.7 |
| | 15-21 | 0.9 |
| | 22-24 | 5.8 |
| July 16-19 | 1-5A | 1.1 |
| | 6-14 | 0.3 |
| | 15-21 | 0.2 |
| | 22-24 | 5.0 |
| July 31-Aug. 1 | 1-5A | 0.6 |
| | 6-14 | 1.3 |
| | 15-21 | 0.5 |
| | 22-24 | 1.0 |
| August 10-14 | 1-5A | 0.4 |
| | 6-14 | 0 |
| | 15-21 | 2.0 |
| | 22-24 | 0 |
| November 25-27 | 1-5A | 0.3 |

The present study showed that chinook fry in the Nechako River were distributed along shallow river margins (0.3 m deep; 0.3 m/sec velocity) soon after emergence from the gravel (late April, early May). Olmsted et al. (1980b) reported that early in the rearing period chinook fry were widely distributed in the upper Nechako River and were concentrated in warm mainstem backwaters. In June, the larger fry moved into deeper, faster flowing water where they remained close to the substrate. Chinook fry observed during the summer and fall rearing period (beach seining and snorkelling data) were found in rapid and riffle areas from Irvine's Lodge to Diamond Island near Smith Creek (Fig. 2), and in rapids or pools associated with rapids and creek outlets from Diamond Island to the confluence of the Nechako and Stuart rivers. Beach seine catches in the evening in June suggested that fry moved into shallow shoreline areas to feed.

Limited beach seining in the fall (November 25, 1980) showed that some chinook fry overwinter in the upper Nechako River between Cheslatta Falls and Greer Creek. Ice conditions on the river prevented reconnaissance of seining stations below Greer Creek. Envirocon (1981b) also reported small catches of chinook fry in late October in the upper Nechako. A small number of smolts sampled in the spring confirms that a proportion of chinook fry overwinter in the upper Nechako (Dept. Fish. Env. 1979b; Olmsted et al. 1980b; Envirocon 1981b). The upper Nechako River below Cheslatta Falls and the river canyons below Greer Creek and the Nautley River were identified as potential overwintering areas (Envirocon 1981b).

In general, the habitat preferences of rearing chinook fry in the Nechako River are consistent with the early life history of chinook reported for other systems including the Stuart River (Lister et al. 1981) and the upper Fraser River tributaries (Rosberg et al. 1981). In those studies, newly emerged fry showed a schooling behaviour and a preference for stream margins and low velocity area; and became more evenly distributed occupying faster, deeper waters as the season progressed. The percentage of fry which emigrated varied with the river system and from year to year. In the Stuart River, an estimated 97% of the fry emigrated to the Nechako River or the lower Fraser River to overwinter (Lister et al. 1981). The upper Nechako River may also have a significant downstream migration as indicated by the substantial seasonal decline in fry catches. This question is further addressed in a later section on capture and marking of chinook juveniles in 1981.

Fyke net trapping

Fyke net trapping results are presented in Appendix 6. Six chinook fry were captured in the Nechako mainstem between July 14 and 19, possibly indicating downstream migration of a small number of chinook fry throughout the summer. Water temperatures at the trapping site measured 17°C to 18°C (Appendix 6).

Inclined plane trapping

Inclined plane trapping results are shown in Appendix 7. Only

three chinook fry were captured in the Nechako mainstem between July 14 and 19. Water temperatures at the trapping site measured 15°C to 16°C (Appendix 7).

Fence trapping

Fence trapping results for Cutoff and Greer creeks are shown in Appendix 8. Little or no chinook migration occurred into or out of Cutoff Creek during September to early November. However, this does not discount the possibility that fish migrated prior to installation or after removal of the trap. If the fish did not migrate to the mainstem Nechako in response to declining temperatures observed in late fall (7°C in November; Appendix 8), significant mortality of juveniles overwintering in the creek could have occurred as a result of possible freezing or low oxygen levels (extremely low flows were observed in Cutoff Creek throughout the sampling season).

Trapping in Greer Creek showed that chinook juveniles migrated downstream throughout the fall; 91 juveniles (4 smolts and 87 fry) were trapped in Greer Creek as they emigrated in September and early October while only 3 chinook fry were captured in the upstream traps.

It is probable that significantly more chinook juveniles migrated from Greer Creek into the Nechako mainstem than is indicated by trapping results. The Greer Creek trap monitored fish migration for less than 30 days and in only half the streamflow, and fall rains in the creek watershed caused undermining of the fence and partial panel washout on two occasions.

Water temperatures at the Cutoff and Greer creek outlets declined from around 9°C in September to 7°C by early November (Appendix 8).

Electroshocking

Estimates of rearing chinook populations in the Nechako tributaries using the electroshocking data are given in Table 4. Detailed catch data are presented in Appendix 9.

The total estimated numbers of chinook juveniles rearing in the Nechako tributaries between Cheslatta Falls and the Stuart River confluence were 42,369 in mid-July and 21,208 in early October 1980. Therefore, approximately half as many juveniles appeared to utilize the same tributaries in the fall as in the summer. This apparent seasonal decline in juvenile numbers may have occurred as a result of predation and/or mortality associated with rapidly changing water levels; and migration of fish to the Nechako mainstem in response to reduced summer creek flows, decreasing water temperatures or reduced availability of food organisms. Fence trapping results for Greer Creek (see above) strongly suggest that fall migration of fry into the Nechako mainstem was at least partially responsible for the reduced utilization of tributaries later in the year. However, the above rearing population estimates should be viewed with caution due to the limited data from which they were derived and the major assumptions made for calculating the estimates for non-electroshocked streams.

Table 4. Estimates of rearing chinook populations in Nechako tributaries, June - October 1980.

| Stream | Total estimated chinook juveniles | | | |
|---|---|---|---|---|
| | June 27-29 | July 16-19 | Aug. 20-21 | Oct. 6-7 |
| Twin Cr. | 2,000 | 1,530 [a] | 1,077 | 800 [a] |
| Cutoff (west) Cr. | 5,067 | 2,000 [a] | 1,333 | 1,000 [a] |
| Swanson Cr. | 10,333 | 6,400 [a] | 6,067 | 3,054 [b] |
| Targe Cr. | 333 | 300 [a] | | 0 [a] |
| Greer Cr. | 4,340 | 1,200 [a] | 767 | 367 [a] |
| Unnamed Cr. No. 1 | | 1,933 [a] | | 2,033 [a] |
| Tahultzu Cr. | | 840 [a] | | 220 [a] |
| Unnamed Cr. No. 2 | | 200 [a] | | 250 [a] |
| Tatsunai Cr. | | 750 [a] | | 33 [a] |
| Unnamed Cr. No. 3 | | 300 [a] | | 250 [a] |
| Kluk Cr. | | 1,000 [a] | | 167 [a] |
| Stony Cr. | | 3,000 [a] | | 1,575 [b] |
| Unnamed Cr. No. 4 | | 4,200 [b] | | 2,100 [b] |
| Trankle Cr. | | 2,100 [b] | | 1,050 [b] |
| Redmond Cr. | | 560 [b] | | 280 [b] |
| Moss Cr. | | 700 [b] | | 350 [b] |
| Unnamed Cr. No. 5 | | 560 [b] | | 280 [b] |
| Clear Cr. | | 139 [b] | | 70 [b] |
| Unnamed Cr. No. 6 | | 139 [b] | | 70 [b] |
| Murray Cr. | | 840 [b] | | 420 [b] |
| Unnamed Cr. No. 7 | | 350 [b] | | 175 [b] |
| Neuco Cr. | | 28 [b] | | 14 [b] |
| Unnamed Cr. No. 8 | | 700 [b] | | 350 [b] |
| Unnamed Cr. No. 9 | | 2,380 [b] | | 1,190 [b] |
| Sinkut R. | | 2,800 [b] | | 1,400 [b] |
| Unnamed Cr. No. 10 | | 1,120 [b] | | 560 [b] |
| Cluculz Cr. | | 4,200 [b] | | 2,100 [b] |
| Unnamed Cr. No. 11 | | 2,100 [b] | | 1,050 [b] |
| Total | | 42,369 | | 21,208 |

[a] Population estimate based on number of chinook fry captured per 30 m stream section; see text.

[b] Estimate based on mean number of chinook fry per 30 m found in streams noted "[a]".

The population estimates of tributary rearing fry were compared to the total estimated chinook fry production in the Nechako River above the Stuart River confluence in 1980. The emergent population in that river segment was assumed to be 585,000 fry, given a deposition of 4,500,000 eggs and a mean natural overwinter survival of 13% for chinook salmon. The mean survival value was obtained using data from Wales and Coots (1955), Gebhards (1958), Lister and Walker (1966) and Major and Mighell (1969). Egg-to-fry survival during the winter of 1979/80 may have been lower due to lower than normal flows in the Nechako River (down to 12.7 $m^3$/sec (450 cfs)) and freezing conditions. Based on the above data, in 1980 the tributaries supported only 7.2% in July and 3.6% in October of the total fry produced in the Nechako mainstem upstream of the Stuart River confluence. The pattern of chinook utilization of tributary streams may vary from year to year. Envirocon (1981b) found that in 1979, tributary populations remained high and relatively constant throughout the summer until the end of October but that in 1980, fish abundance declined by 80% in the late summer.

Snorkelling

Snorkelling observations from June to September reported in Appendix 10 confirmed the presence of large numbers of rearing chinook associated with gravel and cobble substrates in the vicinity of Cheslatta Falls, major spawning areas, rapids and riffle areas immediately downstream from rapids throughout the Nechako mainstem between Cheslatta Falls and the Nautley River confluence (Fig. 4). Generally, chinook fry were observed in water deeper than 0.3 m and flow greater than 0.3 m/sec, and were usually located in close proximity to the river substrate. In late spring (June 24 - 25), large schools of juveniles were seen in the pools immediately below Cheslatta Falls but as the summer progressed small groups (two to 15 fish) or individuals were counted most often.

Underwater observations by divers during the summer and fall indicated decreasing numbers of chinook juveniles rearing in the mainstem between Cheslatta Falls and the Nautley River confluence. This may be a consequence of migration, mortality and/or increasing difficulty in sighting fish as flows increased and fish became larger and better swimmers.

## CAPTURE AND MARKING OF CHINOOK JUVENILES 1981

Migration timing of chinook juveniles

Daily captures of chinook for each trapping area are shown in Figure 23 and Appendix 11. The total chinook catch from March 18 to May 31 for all the upper Nechako River traps above the Cutoff Creek confluence was 68,198 juveniles. Peak catch, indicating peak fry emergence and downstream migration past Cutoff Creek, occurred during the third week of April and the catch declined steadily through May. Subsequent trapping in the upper river during June and September indicated a small but constant downstream migration (Fig. 23, Appendix 11). These data confirm late summer and early fall upper river

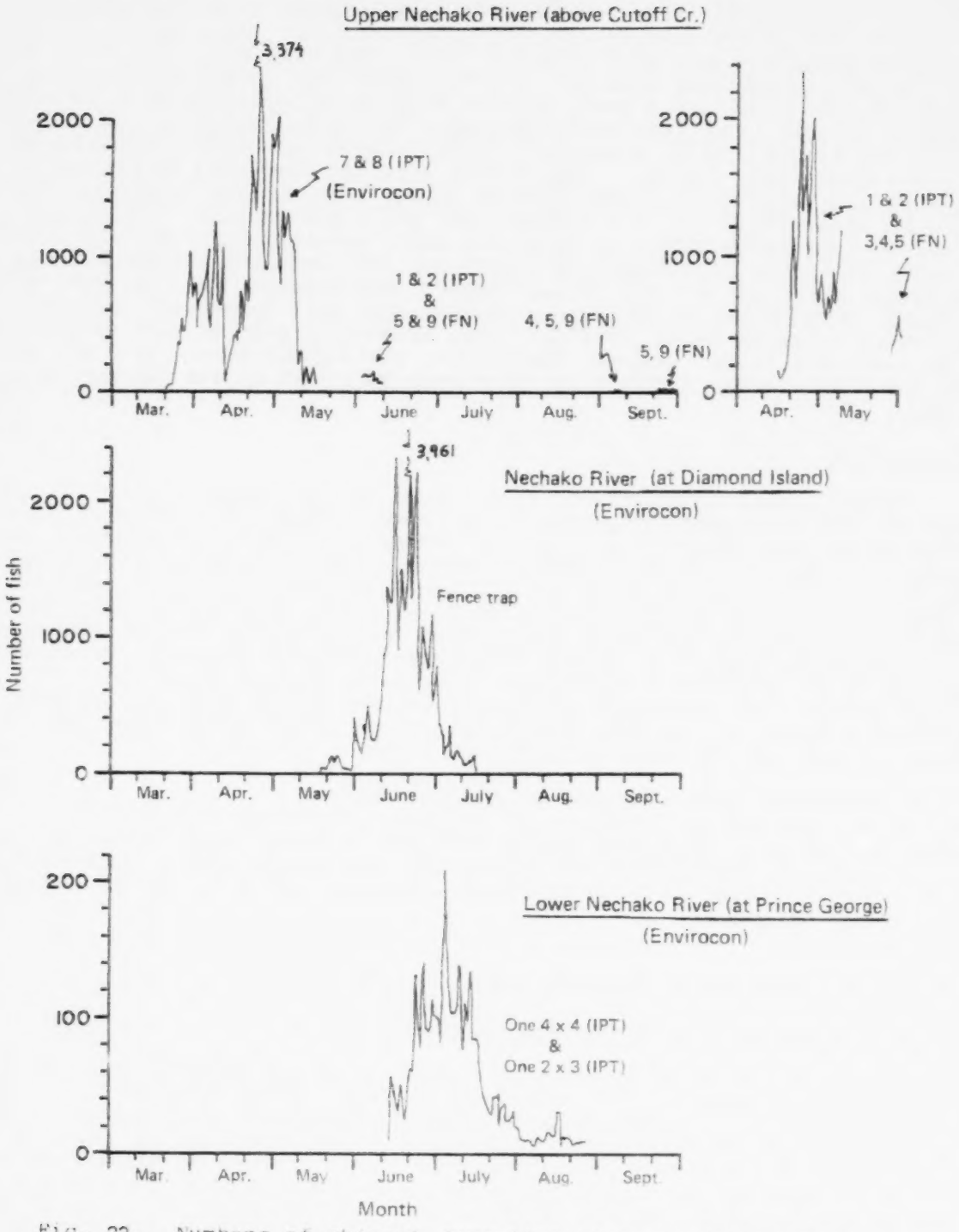



Fig. 23. Numbers of chinook juveniles captured in Nechako mainstem using inclined plane traps (IPT), fyke nets (FN) and a fence trap, March - September 1981 (see Fig. 5 for trap locations ; data from Envirocon Ltd. and DFO).

rearing and may also indicate a small emigration of juveniles during September to October similar to that observed in the Morice River (Dept. Fish. Env. 1979b).

The total chinook catch from May 18 to July 16 for the fence trap at Diamond Island was 31,511 juveniles (Fig. 23, Appendix 11). The catch peaked in the third week of June and declined steadily through July. However, a substantial number of fry probably migrated past the fence before its installation in May since, according to the upper Nechako trapping data, fry emergence began in March. The earlier migrating fry would have originated from the approximately 1,000 chinook that spawned in 1980 upstream between Cutoff Creek and Diamond Island. The later migrating fry captured at the fence in June probably originated largely from the uppermost river sections above Cutoff Creek.

The total catch from June 13 to August 24 for the lower Nechako River at Prince George was 3,706 juveniles and the daily catch at Prince George was an order of magnitude smaller compared to the upper Nechako catch (Fig. 23, Appendix 11). Peak migration at Prince George occurred during the first week of July. However, the traps fished only a small proportion of the flow and did not provide an accurate estimate of the abundance and migration timing of chinook juveniles in the lower Nechako River.

Chinook fry population estimates using egg deposition and mark recapture data

Mark release data are summarized in Table 5 and are presented in detail in Appendices 12, 13 and 14. A total of 57,599 marked chinook fry were released into the Nechako River between March 30 and July 18, 1981 (Table 5). The total number of marked fish was corrected for daily mark retention which generally exceeded 70% (Appendices 12 - 14), post-marking mortality, and fish removal for long-term retention study.

Upper Nechako River above Cutoff Creek

The total 1980 chinook egg deposition in the upper Nechako River above Cutoff Creek was estimated to be 2,175,000 eggs. This was based on an estimate of 870 spawners (Envirocon, unpublished data), a 1:1 sex ratio and a mean fecundity of 5,000 eggs per female (1980 fecundity data) (Table 6).

Chinook egg-to-fry survival in natural redds may range from 0.2% to 42.3% (Wales and Cootes 1955; Gebhards 1961; Lister and Walker 1966; Major and Mighell 1969). Since conditions for incubation in the Nechako River in the winter of 1980/81 were judged to be good, based on flow levels and mild weather conditions experienced in the watershed, the authors estimated the survival rate to be in the upper range. Using a survival rate of 40% an estimated 870,000 chinook fry emerged from the redds above Cutoff Creek (Table 6).

By comparison, emergent fry population size calculated using the mark-recapture data to derive the percent trap efficiency was greatly

TABLE 5. Numbers of marked chinook fry released into the Nechako River, March 30 - July 18, 1981 (data from Envirocon Ltd. 1981a).

| Mark colour | Release site | Release period | No. fry sprayed | No. marks released[a] |
|---|---|---|---|---|
| Red | Above Cutoff Cr. | March 30-May 9 | 52,965 | 36,126[b] |
| Orange | Above Diamond Isl. | June 15-July 18 | 17,588 | 14,098[c] |
| Green | Below Diamond Isl. | May 18-June 15 | 6,445 | 4,916[c] |
| | At Twin Cr. | April 27 | - | 2,459[d] |
| Total | - | March 30-July 18 | - | 57,599 |

[a] Corrected for daily mark retention, post-marking mortality and fish removal for long-term mark retention study.

[b] See Appendices 12 and 13; fish kept for mark retention study not included.

[c] See Appendix 14.

[d] Experiment to calibrate upstream traps.

Table 6. Estimated chinook fry population in Nechako River system in 1981, using available escapement, fecundity and egg-to-fry survival data.

| Nechako River section | Escapement[a] | No. eggs[b] deposited | No. fry[c] emerged |
|---|---|---|---|
| Cheslatta Falls to Cutoff Cr. | 870 | 2,175,000 | 870,000 |
| Cutoff Cr. to Nautley R. | 985 | 2,462,500 | 985,000 |
| Nautley R. to Vanderhoof | 168 | 420,000 | 168,000 |
| Total - | 2,023 | 5,057,500 | 2,023,000 |

[a] Envirocon data (estimates based on counts and residence time on redds; Neilson and Geen (1981) method).

[b] Based on 1:1 sex ratio and 5000 eggs/female.

[c] Based on estimated egg-to-fry survival of 40% (see text).

overestimated at 4 million fry due to the very low mark-recovery rate (254 red marks were recovered above Cutoff Creek or about 1.1% of total marks released above that site; Appendix 15). This indicated that the mark-recapture methods used were unsuited for estimating fry population size; this was confirmed by the 1982 studies (Envirocon 1982).

Another estimate of the downstream migrant population in the upper Nechako River was made using the April 27 mark release. A total of 2,459 green-marked chinook were released at night in different locations of the river above Cutoff Creek in order to lessen the suspected predator-related mortality of marked fry. Of the green-marked chinook released, 21 were recaptured in the upper river traps above Cutoff Creek (0.9% of the total green-marked population). Using this percentage as an estimate of trap efficiency, a much lower population estimate of 2,100,000 migrants was obtained.

Additional downstream trapping and trap recalibration studies conducted by Envirocon Ltd. in 1982 compared mark-recapture estimates with estimates based on the proportion of discharge sampled. The population estimated using the latter technique was approximately 30% of the mark-recapture estimates (Envirocon 1982). Using this correction, the magnitude of the emergent fry population in 1981 would be in the order of 1 million rather than 4 million.

Nechako River above Diamond Island

The total 1980 chinook egg deposition in the Nechako River above Diamond Island was estimated to be 4,637,500 eggs based on an escapement of 1855 chinook between Cheslatta Falls and Nautley River (Table 6). Using a 40% egg-to-fry survival rate (see above), an estimated 1,855,000 chinook fry emerged from the redds above the Diamond Island.

Fry population size migrating past Diamond Island calculated using the mark-recapture data was 649,000 fish (674 marks or 4.8% of the orange-marked chinook released above the fence trap were recovered; Appendices 14 & 16). The above fry population estimated to migrate past the trap represents 35% of the total emergent fry population calculated using egg deposition data. If the mark-recapture estimate is considered to be valid, a large number of chinook fry migrated past the trap location before the trap was installed or remained in the river above Diamond Island.

Of the green-marked chinook released below the fence trap, 41 were recaptured in the fence trap (Appendix 16) indicating that fry also disperse upstream. Any population estimate must therefore take into consideration that a proportion of fish caught are upstream migrants.

Lower Nechako River at Prince George

Of the total number of marked chinook fry released in the Nechako River (57,599 fish; Table 5) only 3 orange-marked fry were recovered at the Prince George traps by July 24. These data are not sufficient

to give an accurate population estimate. They do, however, provide an indication of the timing (late June to early July) of migrating fry and confirm that a proportion of chinook juveniles originating in the upper Nechako migrate downstream to the Fraser River during the summer.

Although estimates of the emergent fry populations and downstream migrants past Diamond Island have been atempted, the problems experienced with deriving estimates from partial trapping methods and the observed biases with mark recapture techniques do not allow the formation of clear conclusions. While trapping at Diamond Island indicates a major downstream migration from the upper Nechako River, the relative utilization of the upper and lower Nechako River and of the Fraser River is still uncertain.

Mark recapture using beach seining and electroshocking

Recapture data of marks by date, capture site and colour are shown in Table 7. A total of 7,013 chinook fry were captured in the Nechako mainstem between May 29 and August 27, 1981 using beach seines, and a total of 2,352 chinook fry were captured in the Nechako tributaries between June 23 and October 10, 1981 using electroshocking techniques (Envirocon 1981a).

All marked chinook fry were initially released between March 30 and July 18, 1981. The subsequent recapture of marks until October indicates that following handling some chinook interrupted their downstream migration to rear in the Nechako mainstem or its tributaries at least until late May and in some cases, until October. Some fish may also disperse upstream. For example, a red-marked fish was recovered near Cheslatta Falls on June 23 indicating that it moved upstream, a distance of some 16 km, over a period of 45 to 85 days.

The above behaviour may apply to a larger proportion of the trapped downstream migrants than indicated since long-term mark retention experiments showed that up to 45% of marked fry may lose their marks after 70 days in captivity and the proportion of wild fish losing their grit marks may be even greater. In addition, marked fish which continued to rear in the river or its tributaries may have been more vulnerable to predation and less vulnerable to trapping gear. If any of the above assumptions are true, relatively few marked fry would be recaptured.

In summary, the trapping data collected in 1981 and the recalibration studies conducted by Envirocon Ltd. in 1982, provide a relatively accurate estimate of chinook emergence and migration timing in the upper Nechako River. Although the program design seemed adequate at the outset, more accurate estimates of numbers of downstream migrants could have been made if the fish traps had been operated from the time of fry emergence to freeze-up at both Diamond Island and Prince George, or if full-stream counting fences had been used.

Table 7. Number of marked chinook fry recaptured by beach seining and electroshocking in Nechako River system, May - October 1981 (Envirocon 1981a)a.

| Date | Capture site (Fig 14) | No. marks |
|---|---|---|
| | **Beach seining in Nechako mainstem** | |
| | Reach | |
| May 29/81 | 2 | 1 red |
| May 29/81 | 3 | 1 red |
| June 8/81 | 2 | 1 red |
| June 11/81 | 4 | 1 red |
| June 10/81 | 4 | 1 green |
| June 23/81 | 1 | 1 red |
| June 24/81 | 2 | 3 red |
| June 24/81 | 4 | 1 orange |
| June 25/81 | 5 | 1 orange |
| June 25/81 | 6 | 1 orange |
| July 1/81 | 2 | 1 red |
| July 3/81 | 5 | 1 orange, 1 green |
| | **Electroshocking in Nechako tributaries** | |
| July 2/81 | Tatsunai Cr. (lower section) | 1 green |
| July 6/81 | Tatsunai Cr. (lower section) | 1 orange |
| July 8/81 | Cluculz Cr. (lower section) | 1 orange |
| July 17/81 | Swanson Cr. | 3 red |
| Oct. 1/81 | Swanson Cr. | 1 red |
| | | Total red: 13<br>Total green: 3<br>Total orange: 6 |

Total chinook captured in Nechako mainstem, May 29 - Aug. 27 = 7,013.
Total chinook captured in Nechako tributaries, June 23 - Oct. 10 = 2,352.

[a] From Envirocon (1981a); Table 22.

SAMPLING OF CHINOOK JUVENILES

Growth of chinook juveniles 1980

The length and weight data for chinook juveniles captured in the Nechako mainstem and tributaries during 1980 are presented by date and site in Appendix 17. Length data showed a steady growth of chinook juveniles during the summer in both the mainstem and tributaries (Fig. 24). Juveniles captured in the mainstem measured about 36 mm at the start of May and 81 mm in August; juveniles captured in the tributaries measured about 57 mm in June and 69 mm in October. Mean fish weight also increased significantly during the sampling period (Appendix 17).

A t-test carried out on the growth regression equations for the mainstem fry ($y = 46.7 + 2.1\ x$) and tributary fry ($y = -34.2 + 4.0\ x$) showed a significantly lower growth rate in the tributaries ($t = 11.82$, 6 d.f., $p < 0.01$). A similar significant difference between the growth rate of Nechako chinook rearing in the mainstem and tributaries was reported in the 1979 Nechako studies (Olmsted et al. 1980). This difference may be explained by a possible movement of larger juveniles out of the tributaries or by the actual slower growth of tributary rearing chinook. The latter may be related to the generally lower mean water temperatures recorded in the tributaries throughout the sampling period compared to the mainstem Nechako (Appendices 5 & 9).

If the tributary rearing chinook juveniles migrate to sea at a smaller size compared to the mainstem rearing chinook, as seems to be indicated by the length data, their chances of survival to adult stage may be reduced (Foerster 1954). Smaller fish may also be predisposed to disease or parasitic infection (Boyce 1979) and may be more readily intercepted by predators. These implications, combined with the estimated small contribution of tributary reared juveniles to the total Nechako chinook production (see previous section) suggest that the Nechako chinook adults originate largely from the mainstem reared juveniles.

Limited data indicate that chinook fry captured in the mainstem in July using an inclined plane trap (mean fish length 36 mm; $n = 3$) and a fyke net (mean fish length 51 mm; $n = 6$) were much smaller compared to the fry captured in the mainstem during the same period using beach seines (mean fish length 70 mm; Fig. 24). This may indicate a downstream displacement of the smaller juveniles by the larger, more aggressive chinook rearing in the beach seined nearshore areas; or it may indicate the inefficiency of the fishing gear to capture larger, faster swimming juveniles.

A coefficient of condition (K; Nikolskii 1963) was used to indicate the general physical condition of the fry. The equation used was:

$$K = \frac{W \times 100}{L^3}$$

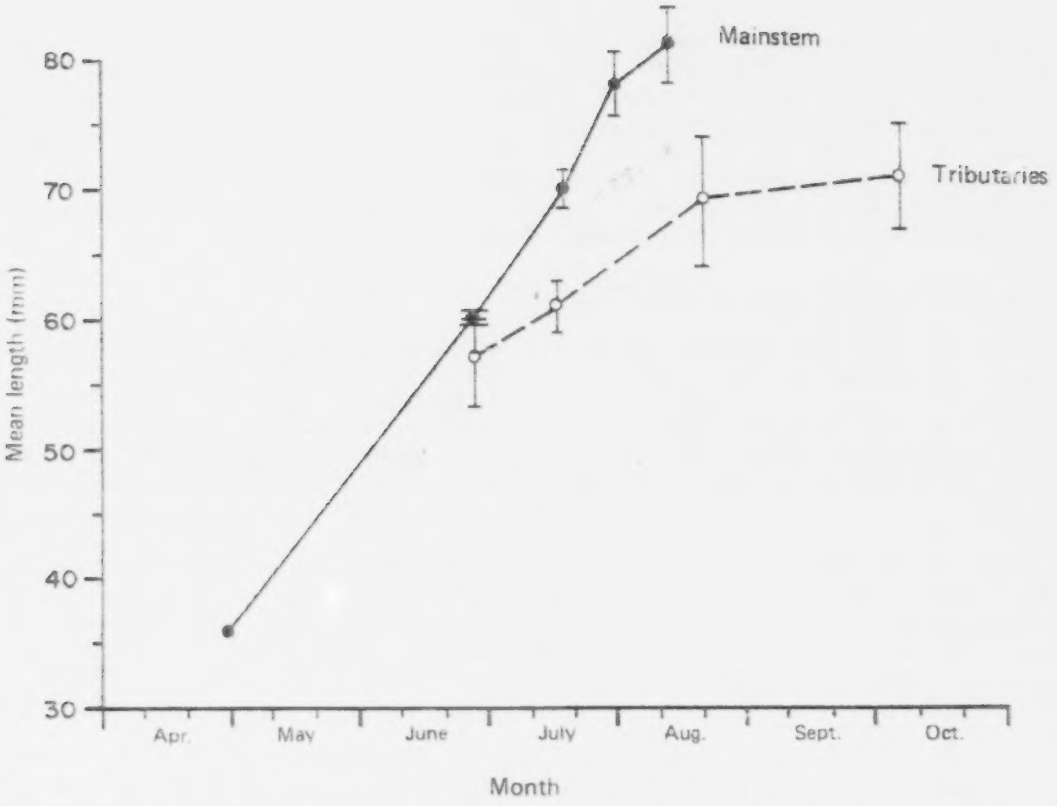



Fig. 24. Mean length(± 1 S.E.) of chinook juveniles captured in Nechako mainstem and tributaries, 1980.

Table 8. Condition factor (K) of chinook juveniles sampled in the Nechako mainstem and tributaries, 1980 (n gives sample size).

| Date | n | K | |
|---|---|---|---|
| | | Mainstem | Tributaries |
| June 24-28 | 161 | 1.31 | - |
| | 96 | - | 1.22 |
| July 16-19 | 36 | 1.26 | - |
| | 114 | - | 1.33 |
| July 31 - August 1 | 17 | 1.22 | - |
| August 10-13 | 10 | 1.31 | - |
| August 20-21 | 36 | - | 1.29 |
| October 6-7 | 29 | - | 1.16 |
| November 25 | 1 | 1.14 | - |
| Mean ± 1 S.E. | | 1.25 ± 0.03 | 1.25 ± 0.04 |

where W and L are fish weight (g) and length (cm) respectively. The condition factor of chinook fry sampled in 1980 was calculated for each sample site and averaged according to the sampling period and location (mainstem or tributaries). Condition factor during summer and fall averaged 1.25 for both the mainstem and tributary fish and showed no obvious seasonal trend except for a slight decline to about 1.15 in the fall (Table 8). This decline may be due to seasonal decrease in water temperature and food availability.

Growth of chinook juveniles 1981

The length and weight data for chinook juveniles captured in the Nechako mainstem during March to September 1981 are presented in Appendix 18. Length data showed no growth of chinook fry from late March to early May followed by a rapid increase in length until the end of September (Fig. 25). Juveniles measured approximately 38 mm and 0.4 g from late March to early May, and over 90 mm and 1.2 g in September.

The above data suggest that the majority of chinook fry sampled prior to May emerged recently and reared briefly or not at all prior to their capture in the inclined plane traps. Fish captured by beach seines or in fyke nets from June until late September presumably reared in the upper Nechako since their emergence and had grown at a stable rate.

Comparison of the mean lengths of chinook juveniles captured in the Nechako mainstem in 1980 and 1981 indicated a similar growth rate for the two years (Figs. 24 & 25). Condition factor (K) increased steadily in 1981 from around 0.7 in April to around 1.4 in September (Fig. 26) and was generally similar to the values reported in 1980 for the same time period (Table 8).

Scale analysis of chinook juveniles captured in 1981 in the Nechako mainstem near Cutoff Creek is given in Appendix 19.

Stomach contents of chinook juveniles 1980

Stomach contents of chinook juveniles sampled in the Nechako mainstem and tributaries during June to October 1980 are summarized in Table 9; samples were pooled separately for the mainstem and tributaries for each sampling period to represent the two general habitats. Detailed data are presented in Appendix 20.

In general, Diptera (Chironomidae in particular) and Ephemeroptera were the dominant prey of both the mainstem and tributary rearing chinook juveniles throughout the sampling period. At any one time, the two combined invertebrate groups averaged up to 89% and up to 83% of the examined prey in the mainstem and tributary fish respectively (Table 9). In addition, Amphipoda, Hemiptera and Hymenoptera (the latter two orders were represented primarily by terrestrial forms) were also important food sources in selected creeks especially in the fall. The incidence of invertebrates of terrestrial origin in tributary rearing chinook diets, especially in late fall samples, reflects the importance of streambank vegetation as a source

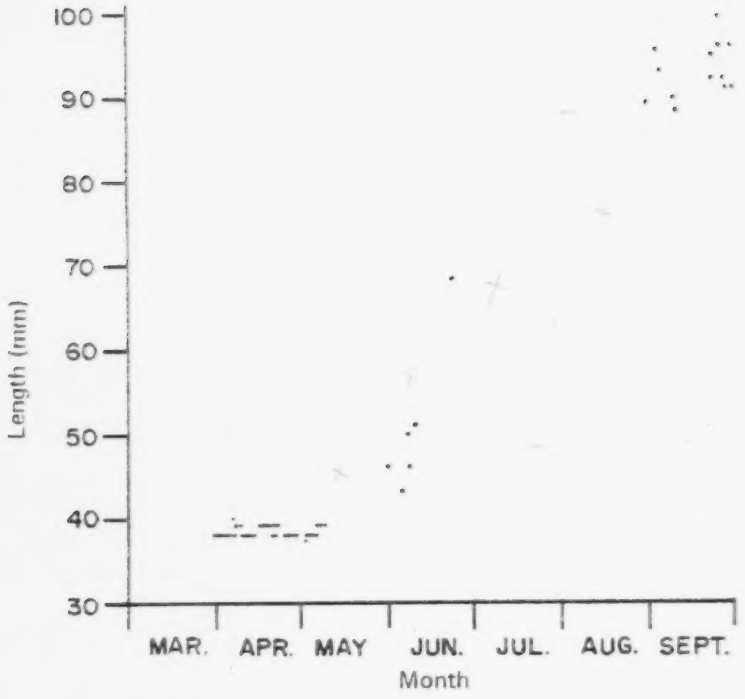



Fig. 25. Mean length of chinook juveniles captured in Nechako mainstem, 1981.

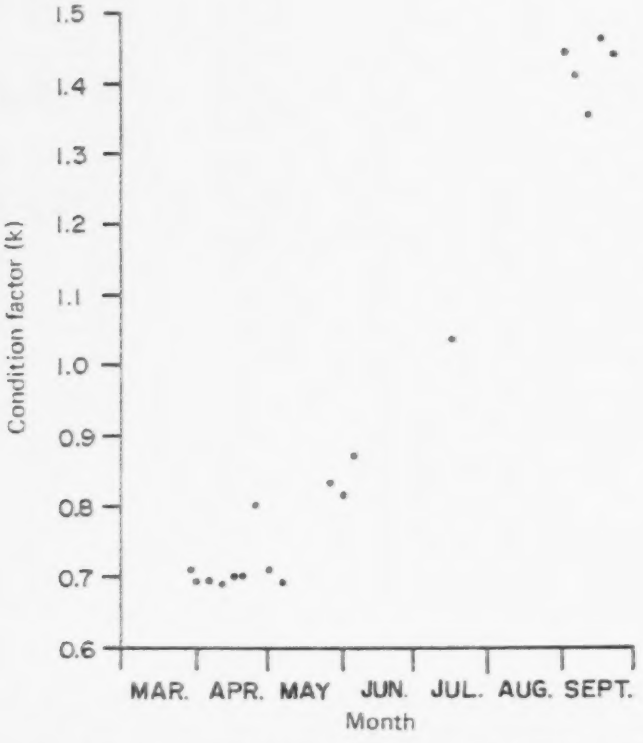



Fig. 26. Condition factor (5-day means) of chinook juveniles captured in Nechako mainstem, 1981.

Table 9. Percent frequency occurrence of each food type in stomachs of chinook juveniles sampled in Nechako mainstem and tributaries, June - October 1980 (n gives number of organisms examined for pooled mainstem or tributary samples).

| Date | n | Aquatic insects: Diptera | Ephemeroptera | Hemiptera | Hymenoptera | Plecoptera | Trichoptera | Other | (Total) | Crustacea[a] | Amphipoda | Other aquatic organisms[b] | Terrestrial organisms[c] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MAINSTEM** | | | | | | | | | | | | | |
| June 25-28 | 250 | 43.6 | 28.0 | 0 | 0 | 0.8 | 10.4 | 0 | (82.8) | 0 | 0.8 | 12.4 | 4.0 |
| July 16-19 | 2628 | 27.3 | 20.5 | 0 | 0 | ~0 | 6.2 | 0 | (54.0) | 34.9[d] | 8.3 | 1.4 | 1.3 |
| July 31-Aug. 1 | 299 | 82.9 | 0.7 | 4.7 | 3.0 | 0 | 0.7 | 7.0 | (99.0) | 0 | 0 | 1.0 | 0 |
| Aug. 10-13 | 626 | 86.4 | 2.7 | 1.9 | 0.2 | 0.8 | 0.5 | 0.3 | (92.8) | 5.6 | 0 | 0 | 1.6 |
| **TRIBUTARIES** | | | | | | | | | | | | | |
| June 25-28 | 151 | 54.3 | 29.1 | 0 | 0 | 5.3 | 7.9 | 0 | (96.6) | 0 | 0 | 0.7 | 2.6 |
| July 16-19 | 1954 | 60.2 | 9.1 | 0.4 | 0.5 | 1.1 | 5.2 | 2.3 | (78.8) | 0 | 0.6 | ~0 | 22.0 |
| Aug. 20-21 | 305 | 63.6 | 8.2 | 3.0 | 4.6 | 0 | 1.3 | 1.6 | (82.3) | 0.3 | 14.1 | 2.6 | 0.7 |
| Oct. 6-7 | 391 | 39.4 | 1.8 | 13.8 | 21.0 | 3.9 | 1.8 | 11.5 | (93.2) | 0 | 4.9 | 0.8 | 1.3 |

[a] Includes Cladocera, Copepoda and Ostracoda.

[b] Includes Mollusca and Acari.

[c] Includes Arachnida.

[d] Overall percent biased by large numbers of Copepoda at site No. 1.



Table 10. Percent frequency occurrence of each food type in stomachs of chinook juveniles sampled in Nechako River at sites No. 3 and No. 11, April - October 1981 (n gives number of organisms examined).

| | Date | n | % Frequency: Diptera | Ephemeroptera | Coleoptera | Hemiptera | Trichoptera | Other |
|---|---|---|---|---|---|---|---|---|
| Site No. 3 | April 27 | 324 | 97.2 | 2.2 | 0 | 0 | 0 | 0.6 |
| | June 7 | 11 | 50.0 | 8.3 | 0 | 0 | 41.7 | 0 |
| | July 20 | 427 | 34.4 | 31.2 | 10.8 | 12.2 | 7.0 | 4.5 |
| | Sept. 29 | 489 | 46.8 | 34.0 | 0.8 | 5.5 | 4.5 | 8.4 |
| Site No. 11 | April 28 | 374 | 99.5 | 0.3 | 0.3 | 0 | 0 | 0 |
| | June 5 | 556 | 87.1 | 1.8 | 0.4 | 0.4 | 0.4 | 10.1 |
| | July 22 | 126 | 52.4 | 14.3 | 23.8 | 0 | 5.6 | 4.0 |
| | Oct. 1 | 6 | 16.7 | 0 | 0 | 0 | 0 | 83.3 |
| Total | Apr. 28-Oct. 1 | 2313 | 70.0 | 14.5 | 3.6 | 3.5 | 3.1 | 5.3 |

of insects which eventually enter the stream and become food for fish.

Site specific diets were also observed. For example, in Cutoff Creek, Amphipoda comprised 69% of the prey examined in August and 61% of the prey examined in October (Appendix 20). At site No. 1 on the mainstem just downstream from Cheslatta Falls and Murray Lake, Copepoda comprised 62% and Amphipoda 14% of the prey examined in July (Appendix 20). The diet of fish sampled at site No. 1 reflects the availability of planktonic and amphipod prey originating in lacustrine areas upstream.

Comparison of the chinook stomach contents with the benthic and drift samples (see below) indicates that Diptera and Ephemeroptera, the dominant prey taken by both the mainstem and tributary rearing chinook, were also the most common organisms in the benthic and drift (Diptera only) samples. This correlation was also observed for specific sites. For example, the predominance of Copepoda in the fish stomachs at site No. 1 was also observed in the benthic and drift samples from that site. This suggests that chinook juveniles rearing in the Nechako system are opportunistic feeders.

Stomach contents of chinook juveniles 1981

Stomach contents of 166 chinook juveniles sampled in the Nechako River at sites No. 3 and No. 11 during April to October are summarized in Table 10. Detailed data are presented in Appendices 21 and 22.

Diptera including Chironomidae were the dominant food organisms throughout the sampling period and averaged 70% of the total prey examined; Diptera were also the major component in the benthic samples (see below). Ephemeroptera including Baetidae,Heptageniidae and Ephemerellidae averaged 14.5% of the total prey examined, while Copepoda, Hemiptera and Trichoptera each contributed around 3% to 4%.

Seasonally, Diptera were the most important prey in the spring (over 97% of prey examined at both sites in April). This was probably related to the spring emergence of large numbers of chironomids in shallow nearshore areas which made them readily available to the newly emerged chinook fry. Chinook diets were most diverse in July and September (no August samples were taken) probably indicating greater diversity among the available prey; this was supported by benthic data (see below).

## BENTHIC SAMPLING

### 1980

Benthic data for the Nechako mainstem and tributaries collected during June to November are summarized in Table 11; since only one sample was taken at each site, samples were pooled separately for the mainstem and tributaries for each sampling period to represent the two general habitats. Detailed data are presented in Appendix 23.

The 1980 benthic study indicated that Diptera (especially chironomids), Ephemeroptera (mayflies), and less often Plecoptera

Table 11. Percent frequency occurrence of organisms in benthic samples from Nechako mainstem and tributaries, June - November 1980 (n gives total number of organisms examined for pooled mainstem and tributary samples).

| Date | n | Diptera[a] | | Ephemeroptera | Plecoptera & Trichoptera | Other aquatic insects[b] | Crustacea[c] | Amphipoda | Mollusca[d] | Other[e] | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MAINSTEM | | | | | |
| June 24-18 | 19,755 | 49.5 | (44.2) | 9.3 | 2.8 | 1.1 | 30.2[f] | 0 | 0.3 | 7.7 | 100 |
| July 16-18 | 1,412 | 70.0 | (58.6) | 9.5 | 3.9 | 0.8 | 7.9 | 0 | 1.1 | 6.9 | 100 |
| Aug. 8-13 | 1,322 | 19.5 | (18.7) | 4.1 | 0.5 | 4.3 | 59.2 | 0.1 | 0.8 | 11.5 | 100 |
| Nov. 27 | 2,258 | 61.3 | (59.3) | 9.0 | 18.0 | 0.1 | 1.9 | 0 | 4.0 | 5.7 | 100 |
| | | | | | | TRIBUTARIES | | | | | |
| June 24-28 | 3,741 | 60.9 | (54.4) | 17.3 | 10.0 | 1.1 | 5.7 | 0.6 | 0.2 | 4.3 | 100 |
| July 16-18 | 9,320 | 60.8 | (57.5) | 18.3 | 8.9 | 3.2 | 0.9 | 0.2 | 0.3 | 7.6 | 100 |
| Aug. 20 | 42[g] | 0 | | 21.4 | 14.3 | 2.4 | 4.8 | 33.3 | 0 | 23.8 | 100 |

[a] Percent Chironomidae in total sample are shown in parenthesis.

[b] Includes Coleoptera, Collembola, Hemiptera and Odonata.

[c] Includes Cladocera, Ostracoda and Copepoda.

[d] Includes Gastropoda and Pelecypoda.

[e] Includes Acari, Oligochaeta, Nematoda, Hirudinea, Hydrozoa, Turbellaria, fish larvae and eggs.

[f] Overall percent biassed by large number of Crustacea at site No. 12.

[g] Only one sample.

(stoneflies) and Trichoptera (caddisflies) were generally the dominant organisms encountered in both the mainstem and tributary samples during the study period; the above combined taxa constituted up to 83% of all mainstem organisms sampled in July and up to 88% of all tributary organisms sampled in June (Table 11). Free-swimming Crustacea (mostly copepods and cladocerans), inadvertently captured in the net, were also abundant in some mainstem samples (85% of the organisms collected in June at site No. 12 and 59% of all mainstem organisms collected in August (Appendix 23).

The presence in August of large numbers of copepods in the mainstem Nechako samples and relatively fewer Ephemeroptera and Plecoptera (Table 11) may be due to the large volume of water released from the reservoir that month in order to reduce the river water temperatures for the migrating sockeye spawners. Most of the captured copepods, characteristic of lacustrine or pool-type environments, were probably recruited in the reservoir inflow. On the other hand, mayflies and stoneflies were apparently adversely affected by scouring and inundation of the shallow shoreline areas where sampling was conducted (H. Mundie, pers. comm.). This suggests that major increases in streamflow such as that which occurred on August 5 may significantly alter the numbers of potential fish prey organisms and consequently may affect the diet of rearing chinook juveniles.

Compared to the mainstem, the tributaries generally displayed a greater benthic diversity. For example, in July, the six mainstem samples contained 24 taxa while the nine tributary samples contained 51 taxa (Appendix 23). The greater benthic diversity in the streams is attributable to the greater range of habitats in the tributaries compared to the mainstem.

Due to limited sampling, seasonal trends in benthic abundance and composition could not be determined. Also, effects of physical habitat parameters, such as water depth and flow, on the structure of the benthic community were not examined, although most samples came from shallow (less than 0.3 m depth) nearshore areas.

1981

Benthic data for the Nechako River sites No. 3 and No. 11 collected during April to October are summarized in Figures 27 and 28 and Tables 12 and 13. Detailed data are presented in Appendix 24; all asterisked items appeared in chinook stomachs at least once.

As in the 1980 benthic study, the 1981 data showed that insects, especially Chironomidae (order Diptera), were the most abundant organisms encountered (Table 13). Chironomidae were numerically dominant at both sites No.3 and No. 11 in most habitats sampled (pools, riffles, runs, nearshore, 1/4 channel, mid-channel) on most sampling dates. Chironomidae constituted up to 80% of most April samples, but were less frequently encountered in the pool habitat at site No. 11 where crustaceans predominated (Table 13a). Ephemeroptera and Trichoptera were also commonly observed and constituted up to 60% of the total sample on some dates. Crustacea were numerically dominant in the shallow habitats (pools, runs, riffles) in April or July at site No. 3 but were relatively infrequent in the deeper habitats (nearshore, 1/4 channel, mid-channel) at that site. At site

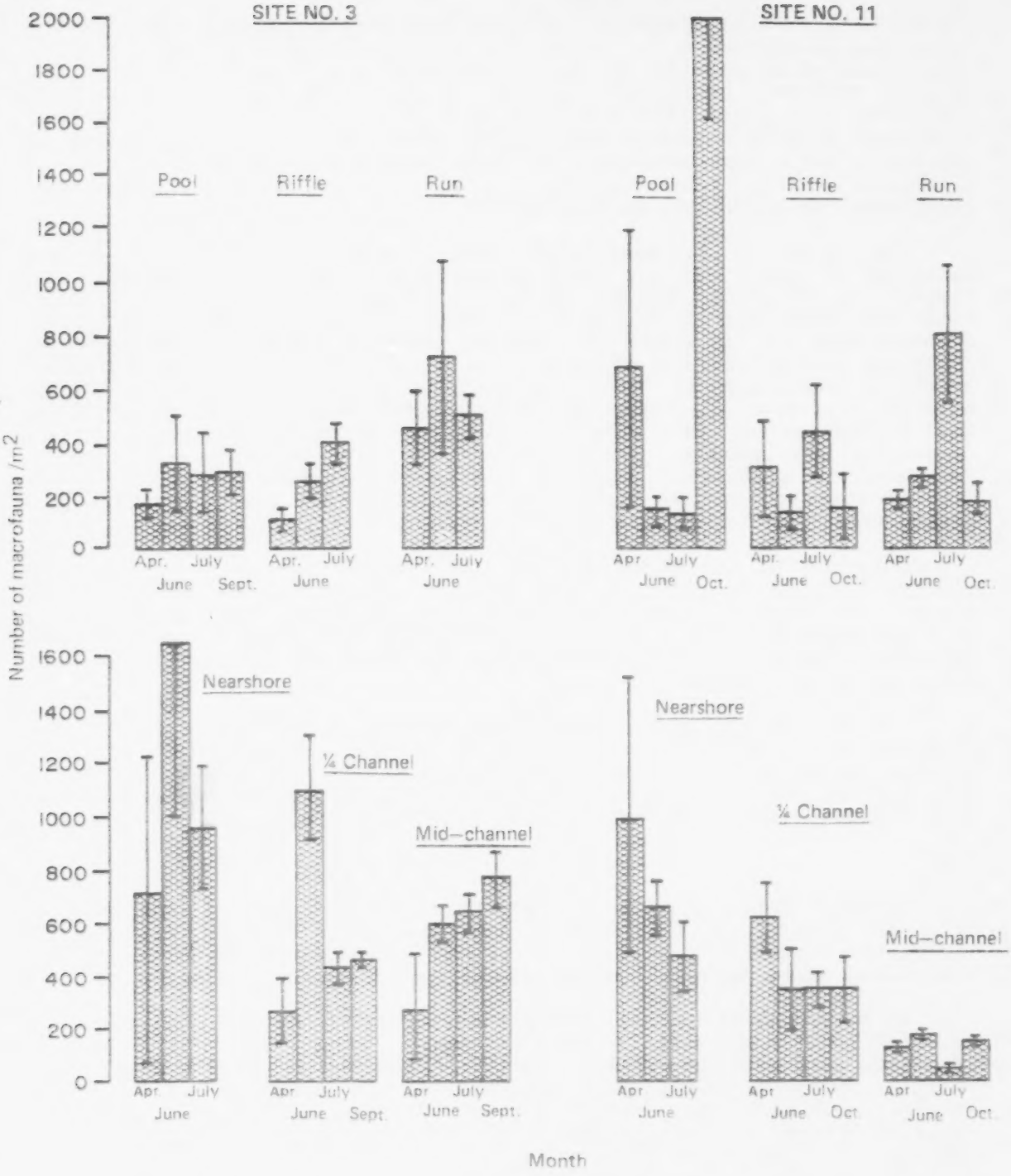



Fig. 27. Abundance per $m^2$ ($\pm$ 1 S.E.) of benthic macrofauna in pools, riffles, runs, nearshore, 1/4 channel and mid-channel areas at sites No. 3 and No. 11, Nechako River, April - September/October 1981.

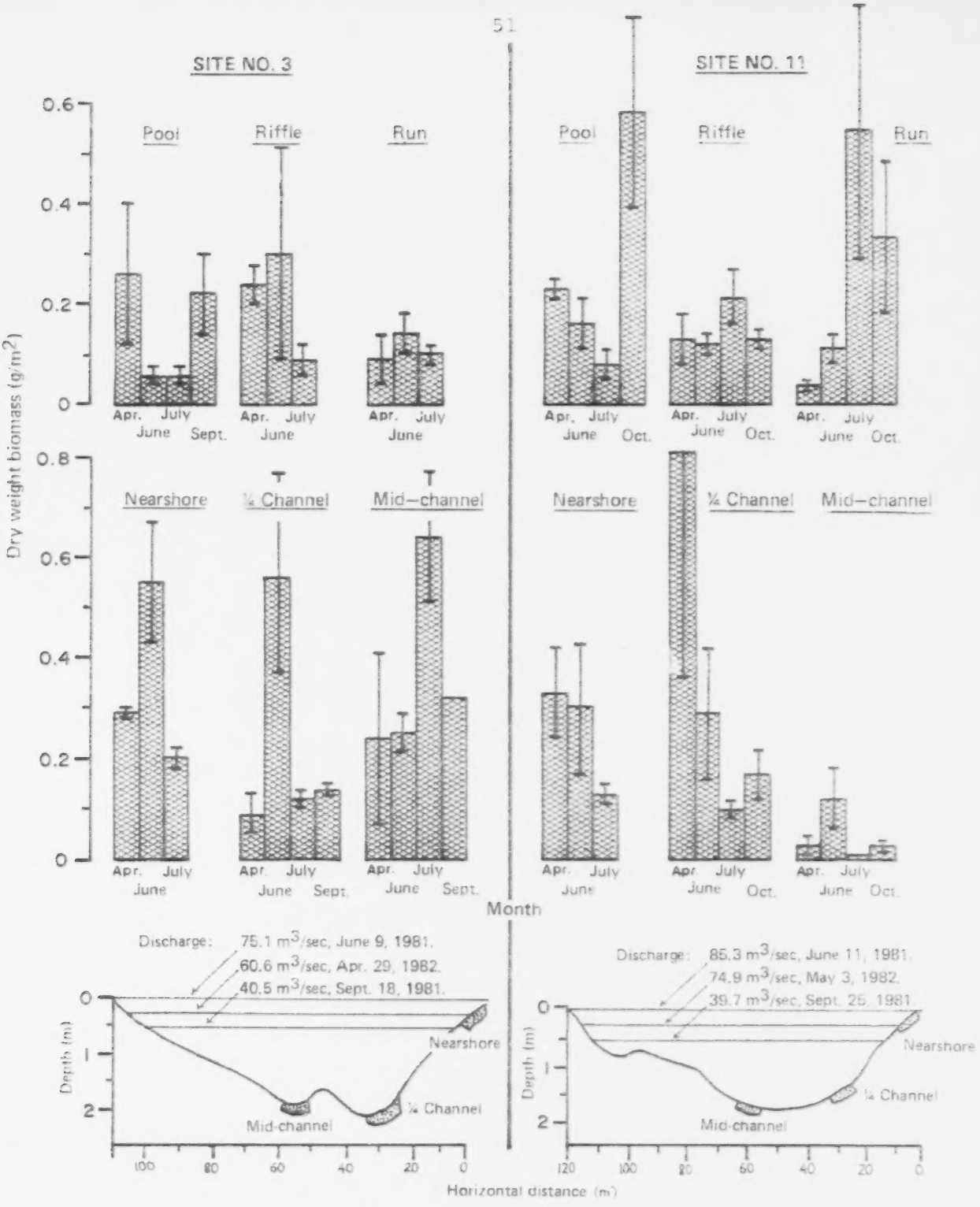



Fig. 28. Dry weight biomass per $m^2$ (± 1 S.E.) of benthic macrofauna in pools, riffles, runs, nearshore, 1/4 channel and mid-channel areas at sites No. 3 and No. 11, Nechako River, April - September/October 1981 (diagrammatic channel transects are shown below).

Table 12a. Mean abundance (No. /$m^2$) and biomass ($g/m^2$) of benthic organisms in different habitats at site No. 3, Nedjako River, 1981 (numbers in parenthesis give ± 1 S.E.).

| Date | Pool | | | | Riffle | | | | Run | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. /$m^2$ | | $g/m^2$ (macrofauna) | | No. /$m^2$ | | $g/m^2$ (macrofauna) | | No. /$m^2$ | | $g/m^2$ (macrofauna) | |
| | Macro-fauna | Total | Wet wt. | Dry wt. | Macro-fauna | Total | Wet wt. | Dry wt. | Macro-fauna | Total | Wet wt. | Dry wt. |
| April 27 | 173.3 (57.6) | 1,645.5 (1,150.3) | 2.30 (1.25) | 0.26 (0.14) | 107.0 (44.7) | 10,344.7 (2,935.9) | 1.21 (0.32) | 0.24 (0.04) | 447.3 (142.1) | 10,584.0 (7,080.6) | 0.64 (0.36) | 0.09 (0.05) |
| June 3 | 329.5 (186.3) | 12,647.8 (3,443.0) | 0.49 (0.17) | 0.06 (0.02) | 242.3 (63.5) | 15,875.3 (6,205.0) | 2.47 (1.71) | 0.30 (0.21) | 713.3 (370.6) | 17,903.3 (3,748.3) | 0.96 (0.22) | 0.14 (0.04) |
| July 20 | 287.5 (143.8) | 21,867.5 (6,907.3) | 0.44 (0.10) | 0.06 (0.02) | 408.7 (83.5) | 16,817.3 (3,569.6) | 0.53 (0.12) | 0.09 (0.03) | 498.3 (75.2) | 19,277.3 (2,429.7) | 0.61 (0.13) | 0.10 (0.02) |
| Sept. 29 | 292.8 (95.4) | 17,029.0 (3,802.2) | 1.23 (0.36) | 0.22 (0.08) | Not sampled. | | | | Not sampled. | | | |
| | Nearshore | | | | 1/4 Channel | | | | Mid-channel | | | |
| April 26 | 711.3 (582.1) | 20,106.0 (4,627.5) | 1.93 (0.18) | 0.29 (0.01) | 265.7 (126.0) | 8,358.7 (3,789.1) | 0.49 (0.18) | 0.09 (0.04) | 278.5 (194.5) | 42,311.5 (17,867.7) | 1.77 (1.12) | 0.24 (0.17) |
| June 3 | 1,651.0 (659.0) | 16,883.7 (1,954.9) | 3.27 (0.71) | 0.55 (0.12) | 1,096.7 (198.0) | 7,746.0 (1,682.4) | 2.67 (0.86) | 0.56 (0.19) | 598.0 (75.1) | 5,668.7 (340.5) | 1.46 (0.18) | 0.25 (0.04) |
| July 21 | 968.3 (228.0) | 7,243.0 (1,282.0) | 1.46 (0.20) | 0.20 (0.02) | 431.0 (62.6) | 9,478.0 (1,403.4) | 0.80 (0.17) | 0.12 (0.02) | 638.3 (69.9) | 10,772.7 (1,041.8) | 4.83 (1.27) | 0.64 (0.13) |
| Sept. 30 | Not sampled. | | | | 453.0 (28.0) | 16,856.0 (2,070.7) | 2.35 (1.53) | 0.14 (0.01) | 779.3 (100.1) | 20,588.0 (3,011.5) | 2.51 (0) | 0.32 (0) |

Table 12b. Mean abundance (No. /$m^2$) and biomass (g/$m^2$) of benthic organisms in different habitats at site No. 11, Nechako River, 1981 (numbers in parenthesis give ± 1 S.E.).

| Date | Pool | | | | Riffle | | | | Run | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. /$m^2$ | | g/$m^2$ (macrofauna) | | No. /$m^2$ | | g/$m^2$ (macrofauna) | | No. /$m^2$ | | g/$m^2$ (macrofauna) | |
| | Macro-fauna | Total | Wet wt. | Dry wt. | Macro-fauna | Total | Wet wt. | Dry wt. | Macro-fauna | Total | Wet wt. | Dry wt. |
| April 28 | 680.0 (522.2) | 26,219.0 (21,176.9) | 1.23 (1.03) | 0.23 (0.02) | 336.0 (181.9) | 7,693.7 (303.7) | 0.86 (0.37) | 0.13 (0.05) | 189.0 (33.0) | 3,204.0 (977.0) | 0.34 (0.11) | 0.04 (0.01) |
| June 4 | 153.3 (57.0) | 20,832.3 (5,876.3) | 1.73 (0.67) | 0.16 (0.05) | 148.0 (29.7) | 19,909.0 (2,124.0) | 0.85 (0.08) | 0.12 (0.02) | 274.7 (35.0) | 10,396.7 (1,908.1) | 0.62 (0.12) | 0.11 (0.03) |
| July 22 | 136.8 (70.5) | 20,735.0 (5,282.6) | 0.66 (0.27) | 0.08 (0.03) | 430.3 (185.1) | 11,524.7 (3,200.5) | 1.14 (0.51) | 0.21 (0.05) | 810.0 (263.7) | 15,010.7 (2,981.7) | 2.03 (0.44) | 0.54 (0.25) |
| Oct. 1 | 1986.5) (379.8) | 29,745.0 (5,649.4) | 5.02 (1.01) | 0.58 (0.19) | 156.3 (128.9) | 3,940.3 (1,916.2) | 1.03 (0.21) | 0.13 (0.02) | 181.0 (62.6) | 2,221.0 (779.8) | 1.44 (0.57) | 0.33 (0.15) |
| | Nearshore | | | | 1/4 Channel | | | | Mid-channel | | | |
| April 29 | 989.3 (535.7) | 9,332.7 (2,542.0) | 2.35 (0.97) | 0.33 (0.09) | 634.7 (137.5) | 13,709.7 (2,666.8) | 3.21 (1.45) | 0.81 (0.45) | 112.7 (18.4) | 3,703.3 (125.2) | 0.74 (0.67) | 0.03 (0.02) |
| June 4 | 657.7 (92.0) | 9,940.7 (1,374.3) | 1.69 (0.27) | 0.30 (0.13) | 361.7 (159.2) | 4,015.0 (1,550.7) | 1.28 (0.64) | 0.29 (0.13) | 181.0 (22.7) | 1,146.7 (129.0) | 0.56 (0.36) | 0.12 (0.06) |
| July 22 | 490.3 (140.6) | 4,839.7 (1,437.0) | 0.73 (0.17) | 0.13 (0.02) | 364.3 (73.8) | 1,221.3 (1,325.0) | 0.60 (0.14) | 0.10 (0.02) | 46.3 (17.3) | 529.3 (95.0) | 0.06 (0.02) | 0.01 (0) |
| Oct. 2 | Not sampled. | | | | 368.7 (122.3) | 7,895.3 (2,842.2) | 0.88 (0.31) | 0.17 (0.05) | 151.0 (21.2) | 1,710.0 (226.3) | 0.15 (0.05) | 0.03 (0.01) |

Table 13a. Percent frequency occurrence of organisms in benthic samples from different habitats at site No. 3, Nechako River, April - September 1981.

| Date | Pool | | | | | | Riffle | | | | | | Run | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Diptera[a] | | E & T[b] | Crus.[c] | Other[d] | Total | Diptera[a] | | E & T[b] | Crus.[c] | Other[d] | Total | Diptera[a] | | E & T[b] | Crus.[c] | Other[d] | Total |
| April 27 | 27.2 | (24.9) | 57.1 | 3.3 | 12.5 | 100 | 16.2 | (14.6) | 4.6 | 77.3 | 1.9 | 100 | 62.9 | (62.0) | 5.3 | 26.1 | 5.7 | 100 |
| June 3 | 70.8 | (54.3) | 4.6 | 10.4 | 14.0 | 100 | 76.4 | (75.2) | 18.9 | 0.8 | 4.0 | 100 | 69.6 | (69.4) | 7.6 | 1.0 | 21.7 | 100 |
| July 20 | 28.8 | (28.3) | 1.4 | 52.5 | 17.4 | 100 | 71.7 | (71.3) | 6.6 | 4.3 | 17.4 | 100 | 68.8 | (68.7) | 10.7 | 5.1 | 15.4 | 100 |
| Sept. 29 | 51.2 | (49.7) | 14.9 | 18.8 | 15.1 | 100 | Not sampled. | | | | | | Not sampled. | | | | | |
| | Nearshore | | | | | | 1/4 Channel | | | | | | Mid-channel | | | | | |
| April 26 | 78.8 | (78.6) | 11.2 | 2.1 | 7.9 | 100 | 65.2 | (64.4) | 17.0 | 7.9 | 9.9 | 100 | 83.3 | (83.1) | 12.7 | 1.6 | 2.4 | 100 |
| June 3 | 70.1 | (68.2) | 18.2 | 0.3 | 11.5 | 100 | 44.6 | (43.5) | 12.5 | 1.2 | 41.8 | 100 | 39.5 | (38.5) | 15.0 | 1.6 | 44.0 | 100 |
| July 21 | 73.0 | (72.4) | 12.9 | 0.9 | 13.3 | 100 | 48.6 | (48.3) | 9.8 | 1.3 | 40.3 | 100 | 65.6 | (65.0) | 9.7 | 0.2 | 24.5 | 100 |
| Sept. 30 | Not sampled. | | | | | | 37.4 | (36.3) | 29.2 | 1.7 | 31.7 | 100 | 38.9 | (38.3) | 26.8 | 0.2 | 34.2 | 100 |

[a] Percent Chironomidae in total sample are shown in parentheis.

[b] Ephemeroptera and Trichoptera.

[c] Crustacea includes Cladocera, Ostracoda and Copepoda.

[d] See Appendix 24 for taxa.



Table 13b. Percent frequency occurrence of organisms in benthic samples from different habitats at site No. 11, Nechako River, April - October 1981.

| Date | Pool | | | | | | Riffle | | | | | | Run | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Diptera[a] | | E & T[b] | Crus.[c] | Other[d] | Total | Diptera[a] | | E & T[b] | Crus.[c] | Other[d] | Total | Diptera[a] | | E & T[b] | Crus.[c] | Other[d] | Total |
| April 28 | 15.4 | (7.9) | 0.9 | 29.2 | 54.6 | 100 | 74.6 | (43.4) | 2.4 | 5.8 | 17.2 | 100 | 77.0 | (76.2) | 0.6 | 10.9 | 11.4 | 100 |
| June 4 | 41.0 | (34.7) | 1.1 | 42.0 | 16.0 | 100 | 52.3 | (50.6) | 15.3 | 2.0 | 30.4 | 100 | 65.1 | (64.7) | 6.0 | 3.6 | 25.4 | 100 |
| July 22 | 18.8 | (17.4) | 0.5 | 70.6 | 10.1 | 100 | 64.3 | (26.6) | 14.6 | 3.3 | 17.9 | 100 | 51.3 | (46.1) | 12.6 | 6.7 | 29.5 | 100 |
| Oct. 1 | 9.8 | (7.1) | 3.3 | 44.1 | 42.8 | 100 | 24.2 | (23.9) | 63.8 | 0.1 | 11.9 | 100 | 45.2 | (44.3) | 17.1 | 1.0 | 36.9 | 100 |
| | Nearshore | | | | | | 1/4 Channel | | | | | | Mid-channel | | | | | |
| April 29 | 80.0 | (79.2) | 6.1 | 2.3 | 11.6 | 100 | 82.4 | (81.4) | 6.9 | 0.5 | 10.2 | 100 | 77.3 | (73.0) | 6.0 | 0.9 | 15.9 | 100 |
| June 4 | 50.1 | (48.4) | 14.1 | 3.4 | 32.4 | 100 | 55.7 | (54.8) | 15.3 | 1.5 | 27.5 | 100 | 24.8 | (20.2) | 42.3 | 0.6 | 33.1 | 100 |
| July 22 | 36.6 | (36.4) | 8.9 | 8.7 | 45.7 | 100 | 49.7 | (47.9) | 11.1 | 0.5 | 39.7 | 100 | 39.1 | (33.4) | 32.2 | 1.5 | 27.2 | 100 |
| Oct. 2 | Not sampled. | | | | | | 44.2 | (40.9) | 28.1 | 0.6 | 27.0 | 100 | 40.3 | (16.5) | 25.8 | 0.4 | 33.6 | 100 |

[a,b,c,d] See Table 13a.

No. 11, Crustacea were important only in the slow flowing pools. Benthic diversity as indicated by the proportion of other taxa was generally lowest in April.

Macrofauna abundance and their dry weight biomass showed considerable variation by date, habitat type and site. Seasonally, the number of macroorganisms/$m^2$ increased from April to June and July in most in the habitats sampled at site No. 3, but some of the highest values were also observed in April at site No. 11 (Fig. 27). Apparently, shallow habitats at site No. 3 had been dewatered shortly before sampling began probably resulting in the low April benthic abundance. Dry weight of macrofauna was generally very low, rarely exceeding 0.5g/$m^2$ (Fig. 28) and showed no clear seasonal trend among the different habitats sampled. However, the biomass was lowest in July at most sites sampled probably due to the seasonal emergence of insects (see 1981 drift section below).

No clear differences in benthic abundance and biomass were observed in pools, riffles and runs. The variability observed seasonally and between sites made it difficult to isolate the influence of different habitat parameters. In general, benthic abundance ranged from 200 to 500 macrofauna/$m^2$ and benthic biomass was usually below 0.3 g/$m^2$. The similarity in numbers of macrofauna in pools and riffles particularly at site No. 2 was probably due to algae and macrophytes supporting invertebrates in the pools.

Benthic abundance appeared to decline with increasing water depth (shallow nearshore vs deeper 1/4 channel and mid-channel habitats) at both sites No. 3 and No. 11 but biomass showed no clear trend with depth especially at site No. 3. Lowest benthic abundance and biomass were consistently observed at the mid-channel station at site No. 11; by comparison, the mid-channel station at site No. 3 had relatively high benthic abundance and biomass at all times, possibly indicating the nutritive influence of the Nechako impoundment and a stable substrate.

The 1981 benthic study was limited by the small number of replicates (usually 3) taken at each sampling station. This gave only an approximate indication of benthic abundance in each habitat and resulted in wide confidence limits about the means.

Physical sampling of benthic sites 1981, 1982

Water temperature, velocity and depth in different habitats sampled for benthos at sites No. 3 and No. 11 in the Nechako River in 1981 are shown in Appendix 25. Similar seasonal temperatures were generally observed at all the benthic habitats sampled (pools, riffles, runs, nearshore, 1/4 channel and mid-channel areas). Water temperature generally increased from around 3°C in late April to around 19°C in July, then declined to around 9°C by late September. Spring water temperatures were slightly warmer in the pool, riffle and run habitats at site No. 11 compared to other sampling sites.

Similar shallow water depths (mean 0.3m - 0.4 m) were generally observed in the pool, riffle and run habitats at both sites No. 3 and

No. 11, but nose velocities increased from less than 0.03 m/sec in pools to 0.3 - 0.4 m/sec in runs to 0.7 m/sec in riffles.

Similar nose velocities of 0.5 - 0.7 m/sec were observed in the nearshore, 1/4 channel and mid-channel habitats at both sites No. 3 and No. 11 but water depth increased from 0.6 m - 0.8 m in nearshore areas to 1.3 m - 1.8 m in 1/4 channel and mid-channel areas.

Similar coarse substrate was observed in runs, riffles, and nearshore habitats where particles greater than 38 mm in diameter constituted generally over 50% of the total volume sampled (see Appendix 26 for examples of substrate analysis). Substrate in the pools, however, was composed primarily of particles smaller than 38 mm in diameter. This difference in substrate type between pools and other sampled sites may help explain some of the site specific differences in the composition of benthic fauna; however, the results are inconclusive due to the small number of benthic replicates.

In summary, all habitat types sampled contributed significantly to benthic production. However, the biomass (dry weight) of benthic macrofauna was low, generally below 0.5 $g/m^2$. There was considerable variability in spatial and temperal distribution of benthos but correlations between benthic biomass and the physical parameters measured (velocity, depth and substrate) were not readily apparent. In general, the largest differences in species composition occurred in pools where velocities and substrate compositions differed most from other habitats sampled. There was also an indication that benthic biomass was higher in nearshore shallow habitats compared to deeper 1/4 channel and mid-channel areas. This difference was observed at site No. 11 but not at site No. 3 where benthos was distributed relatively evenly across the channel.

## DRIFT SAMPLING

### 1980

Drift data collected during June to August at the Nechako River beach seining sites No. 1, 3, 5, 5A and 11 (Fig. 2) are shown in Appendix 27. The limited data were intended to supplement the benthic and fish stomach content analyses and showed that, as in the benthic samples, Diptera (especially immature stages) were the dominant organisms collected (92% of all drift organisms except at site No. 1 in July). At site No. 1 in July, 93% of the drift organisms examined were Copepoda. These were probably recruited from Murray Lake located immediately upstream of site No. 1 (Fig. 2).

### 1981

Drift data collected during April to October at the Nechako River sites No. 3 and No. 11 (Fig. 2) are summarized in Figure 29 and Table 14 and are presented in detail in Appendix 28.

As in the 1980 drift samples, Diptera, especially Chironomidae, were the dominant organisms collected (56% of all organisms at site No. 3 and 74% at site No. 11; Table 14). Seasonally, Diptera were

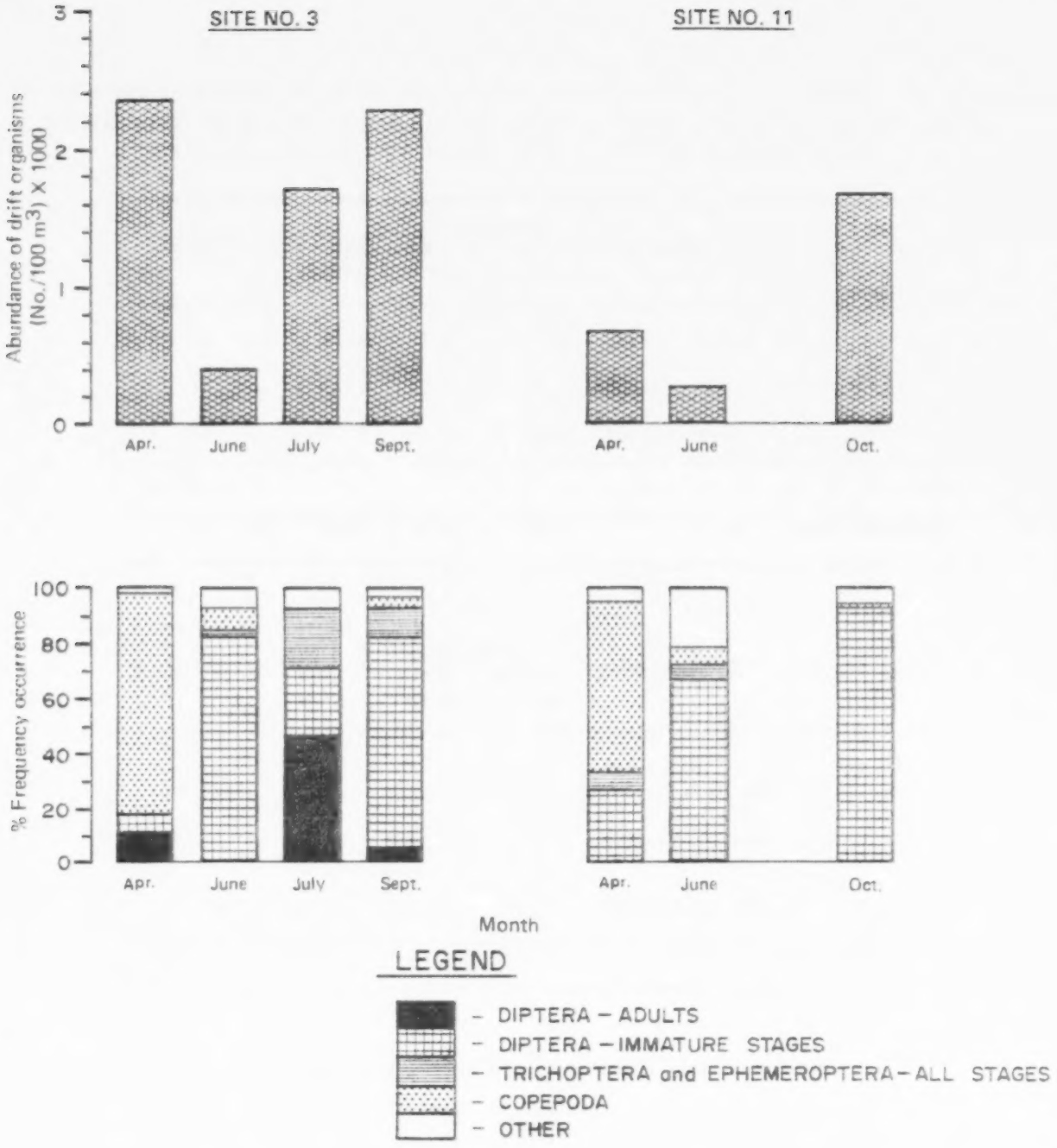



Fig. 29. Abundance of drift organisms and frequency of occurrence of different taxa at sites No. 3 and No. 11, Nechako River, April - October 1981.

Table 14. Percent frequency occurrence of organisms in drift samples at sites No. 3 and No. 11, Nechako River, April - October 1981 (n gives mean number of organisms /100 $m^3$; percent immature Diptera in total sample are given in parenthesis).

| Date | Site No. 3 n | Diptera | | Tricho-ptera | Epheme-roptera | Cope-poda | Other | Total |
|---|---|---|---|---|---|---|---|---|
| Apr. 28 | 2,378 | 16.9 | (7.2) | 0 | 0.6 | 82.0 | 0.5 | 100 |
| Apr. 29 | - | - | - | - | - | - | - | - |
| June 3 | 397 | 82.6 | (82.6) | 1.0 | 2.3 | 7.3 | 6.8 | 100 |
| June 5 | - | - | - | - | - | - | - | - |
| July 20 | 1,730 | 70.4 | (25.2) | 10.8 | 11.2 | 0.5 | 7.2 | 100 |
| Sept. 29 | 2,272 | 82.5 | (78.1) | 6.1 | 5.1 | 2.7 | 3.5 | 100 |
| Oct. 2 | - | - | - | - | - | - | - | - |
| Seasonal mean | | 56.4 | | 4.9 | 4.9 | 30.2 | 3.6 | 100 |

| Date | Site No. 11 n | Diptera | | Tricho-ptera | Epheme-roptera | Cope-poda | Other | Total |
|---|---|---|---|---|---|---|---|---|
| Apr. 28 | - | - | - | - | - | - | - | - |
| Apr. 29 | 660 | 27.1 | (99.3) | 1.2 | 4.1 | 62.4 | 5.2 | 100 |
| June 3 | - | - | - | - | - | - | - | - |
| June 5 | 261 | 67.0 | (99.1) | 0 | 3.8 | 6.5 | 22.6 | 100 |
| July 20 | - | - | - | - | - | - | - | - |
| Sept. 29 | - | - | - | - | - | - | - | - |
| Oct. 2 | 1,673 | 93.0 | (100) | 0.5 | 0.5 | 0.2 | 5.7 | 100 |
| Seasonal mean | | 73.6 | | 0.7 | 1.8 | 16.7 | 7.3 | 100 |

[a] Not sampled in July due to rapidly increasing flows.

most frequently encountered in June and September/October; the immature Diptera stages contributed up to 93% to the total October sample at site No. 11 (Fig. 29). Copepoda were next in overall importance (30% of all organisms at site No. 3 and 17% at site No. 11). Seasonally, Copepoda were most common in April at both sites contributing 82% to the April samples at site No. 3. The Trichoptera and Ephemeroptera combined contributed less than 10% to the pooled samples and were most common in July (22% of organisms sampled at site No. 3).

Non-chironomid Diptera appeared in greatest density and diversity in the adult life stages in July at site No. 3 (Fig. 29); no July drift samples were obtained at site No. 11 due to rapidly increasing flows. Except for Simuliidae, larvae and pupae of non-chironomid Diptera rarely occurred in the drift and terrestrial drift forms were rare at both sites. The latter may reflect the lack of vegetation cover relative to the channel width.

Drift organisms reached a maximum abundance of nearly 2400/100 $m^3$ in April at site No. 3 (Fig. 29), mostly due to large numbers of Copepoda. Abundance of drift organisms was lowest in June at both sites (less than 400/100 $m^3$). Drift densities in April were nearly four times higher at site No. 3 compared to site No. 11, possibly reflecting the influence of the upstream lake system from which the Nechako River is regulated. Due to limited sampling, seasonal abundance of drift organisms could not be quantified.

The available drift data were compared to the benthic data for the same sites. Diptera were numerically dominant in both the benthos and the drift. In July, benthic biomass was at its lowest point at most sites sampled (Fig. 28) although drift density was relatively high. The relatively large numbers of late instars and adult forms found in the July drift (Appendix 28) suggests that in late spring and early summer many species of insects emerge, so that benthic biomass may decline. The lowest benthic biomass therefore may occur in mid-summer during the period of greatest drift intensity.

The lower numbers of taxa in the drift compared to the benthos are probably a reflextion of sample size.

## REARING HABITAT ASSESSMENT 1982

### Survey of channel cross-sections

Surveyed channel cross-sections were analysed to determine the effect of reduced discharge on rearing area as defined by the following criteria: depth greater than 15 cm; velocity 0 - 40 cm/sec. The above depth and velocity criteria used in the analysis were generalized from Bovee (1978) and from field observations in the Nechako River. The surveyed section of the Nechako River between Cheslatta Falls and Fort Fraser (Fig. 17) is approximately 83 km long and generally flows in a meandering single channel; however, some multi-channeled areas are also present. The 14 representative cross-sections surveyed for depth and velocity at different discharges were

divided into three categories based on channel configuration.

Single channel sections

Typical single channel cross-sections showing the wetted width with suitable rearing habitat are shown in Figure 30. Generally, in the single channel sections the percent of river width with depth and velocity parameters suitable for rearing increased at lower discharges mainly due to reduced velocities toward the mid-channel (Table 15).

Dual channel sections

In the main channel of a dual channel river section, the percent of river width with depth and velocity parameters suitable for rearing also increased at lower discharges but to a lesser extent than in the single channel sections (Table 15). It appeared that side channels generally had higher velocities and a relatively smaller suitable rearing habitat compared to the main channel. In the case where a dual channel section became a single channel at a higher discharge, the suitable rearing habitat in both the main and side channels increased significantly with increasing discharge.

Single channels with back eddies

Suitable rearing habitat in single channels with back eddies and/or gradually sloping banks remained relatively constant with changes in discharge. As discharge decreased, the gain in the available habitat towards mid-channel due to decreasing velocities was offset by the loss of habitat due to decreasing depth adjacent to the shallow banks.

Using the above noted depth and velocity criteria only, the above analysis indicates that rearing habitat increases with decreasing discharge. It should be noted, however, that this analysis was based on a limited number of transects and did not consider other aspects of the rearing environment such as gravel quality, availability of cover and food production. Recognizing the potential importance of shallow nearshore habitats and side channel habitats for food production and the utilization of these areas by chinook fry, the reduction in wetted river width and side channels with decreasing flows was also investigated.

Reduction in wetted river width due to decreasing discharge

The above cross-sectional surveys for single channels and single channels with back eddies were analysed to determine the reduction in wetted river width due to decreasing discharge. Data for dual channel sections could not be utilized because several additional measurements would be required to indicate the changing proportion of flow in each channel with decreasing discharge and the discharge at which the section changes to a single channel flow.

Single channels

Nine single channel cross-sections which were measured at two

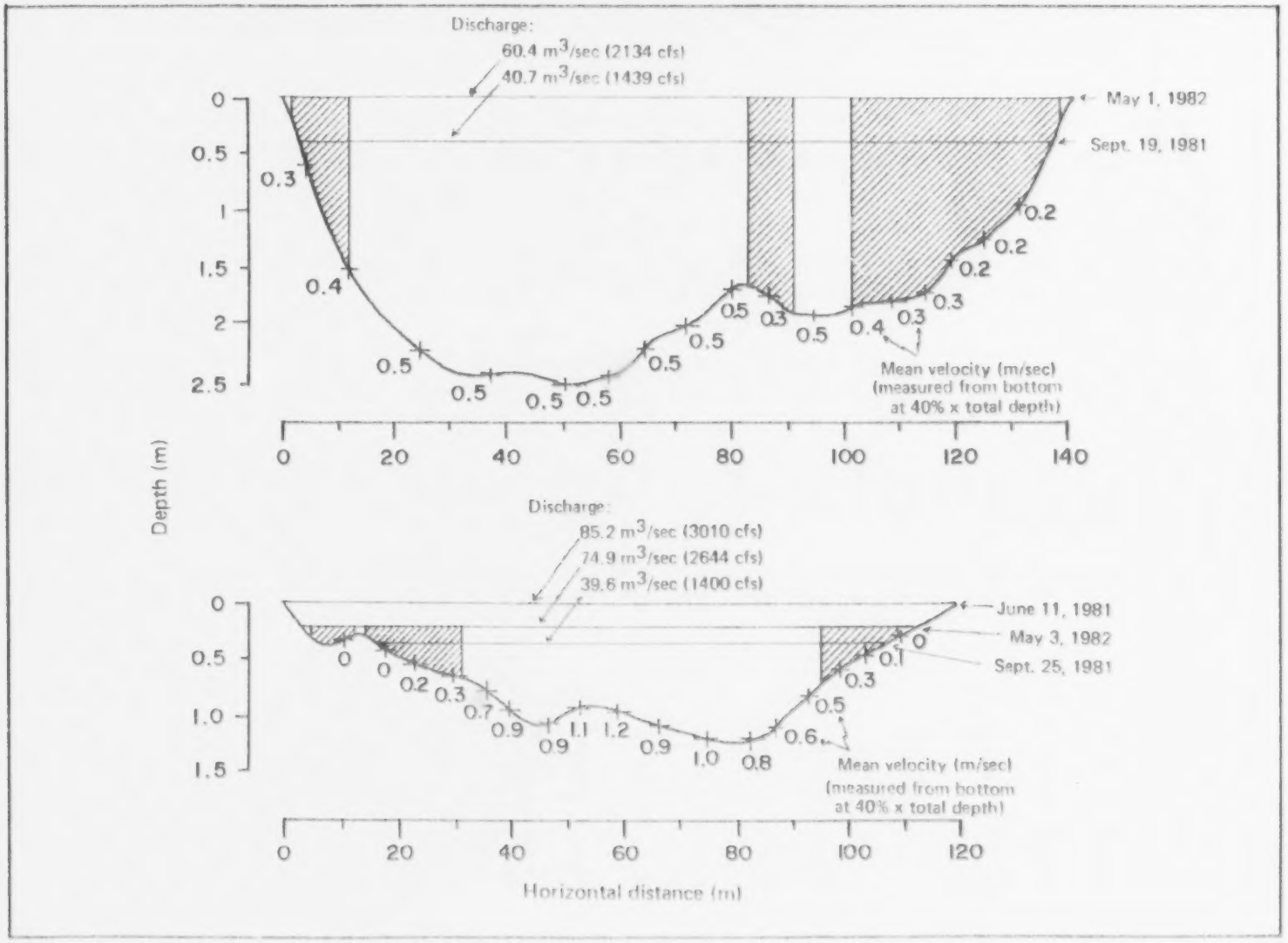



Fig. 30. Typical river cross-sections showing suitable chinook rearing habitat (hatched) at discharges of 60.4 $m^3$/sec (above) and 74.9 $m^3$/sec (below), Nechako River, 1982 (diagrammatic).

Table 15. River width measurements at different discharges for 14 Nechako River cross-sections, 1982.

| Section No. | Section type | | Discharge $m^3$/sec | (cfs) | River width Total (m) | Suitable for rearing (m) | (% of total) |
|---|---|---|---|---|---|---|---|
| 1 | Single channel | | 64.5 | (2280) | 72.2 | 12.2 | 17 |
| | | | 38.6 | (1365) | 65.5 | 11.9 | 18 |
| 2 | Single channel | | 70.8 | (2500) | 56.1 | 1.2 | 2 |
| | | | 43.9 | (1550) | 51.8 | 12.2 | 24 |
| 3 | Single channel | | 84.4 | (2980) | 76.2 | 14.6 | 19 |
| | | | 63.7 | (2250) | 70.7 | 20.7 | 29 |
| | | | 40.8 | (1440) | 61.0 | 25.3 | 42 |
| 4 | Single channel | | 75.0 | (2650) | 110.0 | 22.6 | 20 |
| | | | 60.6 | (2140) | 101.8 | 29.9 | 29 |
| | | | 40.5 | (1430) | 93.9 | 30.5 | 32 |
| 5 | Single channel | | 61.3 | (2165) | 73.2 | 25.3 | 35 |
| | | | 37.9 | (1340) | 73.2 | 35.4 | 48 |
| 6 | Single channel | | 79.6 | (2810) | 70.4 | 21.6 | 31 |
| | | | 37.7 | (1330) | 64.6 | 46.0 | 71 |
| 7 | Single channel | | 60.4 | (2135) | 87.8 | 34.4 | 39 |
| | | | 40.8 | (1440) | 86.0 | 51.8 | 60 |
| 8 | Single channel | | 63.1 | (2230) | 48.5 | 14.6 | 30 |
| | | | 39.5 | (1395) | 45.1 | 17.4 | 39 |
| 9 | Single channel | | 63.8 | (2255) | 96.0 | 3.7 | 4 |
| | | | 39.9 | (1410) | 88.1 | 1.2 | 1 |
| 10 | Single channel | | 85.2 | (3010) | 120.7 | 29.9 | 25 |
| | | | 74.9 | (2645) | 110.0 | 212.6 | 20 |
| | | | 39.6 | (1400) | 96.9 | 18.9 | 19 |
| 11 | Dual channel | main | 41.3 | (1460) | 73.7 | 2.7 | 4 |
| | | | 28.3 | (1000) | 66.1 | 7.0 | 11 |
| | | side | 17.3 | (610) | 39.9 | 1.5 | 4 |
| | | | 9.9 | (350) | 31.1 | 0 | 0 |
| 12 | Dual channel | main | 54.6 | (1930) | 71.9 | 4.6 | 6 |
| | | | 36.8 | (1300) | 64.9 | 4.6 | 7 |
| | | side | 6.1 | (215) | 24.4 | 0 | 0 |
| | | | 1.7 | (60) | 14.0 | 0 | 0 |
| 13 | Dual channel | main | 61.9 | (2185) | 136.6 | 62.8 | 46 |
| | | | 5.1 | (180) | 46.0 | 5.5 | 12 |
| | | side | 32.0 | (1130) | 61.9 | 10.1 | 16 |
| 14 | Single channel with back eddy | | 81.8 | (2890) | 88.1 | 44.2 | 50 |
| | | | 62.0 | (2190) | 83.5 | 40.5 | 49 |
| | | | 38.1 | (1345) | 78.6 | 39.9 | 51 |

average discharges of 39.6 $m^3$/sec (1400 cfs) and 64.5 $m^3$/sec (2280 cfs) were analyzed. Discharges below this range were extrapolated to as low as 14.2 $m^3$/sec (500 cfs). The discharge of 56.6 $m^3$/sec (2000 cfs) was used as the datum since this was the regulated flow from April 1 to September 1, 1982. The lower calculated values for wetted widths were only approximate since they were well outside the range of measured discharges.

As the discharge decreased from 56.6 $m^3$/sec (2000 cfs) to 14.2 $m^3$/sec (500 cfs), the mean wetted width in the nine surveyed single channel sections declined from 73 m to 57 m (Fig. 31, Table 16). The average calculated percent reduction in wetted width resulting from decreasing discharge was as follows:

| Discharge | | Reduction in wetted river width |
|---|---|---|
| $m^3$/sec | cfs | |
| 56.6 | 2000 | 0 % |
| 42.5 | 1500 | 4 % |
| 28.3 | 1000 | 11 % |
| 14.2 | 500 | 23 % |

Single channels with back eddies

Two cross-sections were measured at locations where gentle back eddies or areas of calm water were observed adjacent to one bank. In both cases, the area of calm water was relatively shallow in depth and the deeper portion of the channel was situated closer to the opposite bank. The discharge of 56.7 $m^3$/sec (2000 cfs) was again chosen as the datum and values for wetted width were extrapolated to 14.2 $m^3$/sec (500 cfs). The results were as follows:

| Discharge | | Reduction in wetted river width |
|---|---|---|
| $m^3$/sec | cfs | |
| 56.6 | 2000 | 0 % |
| 42.5 | 1500 | 4 % |
| 28.3 | 1000 | 17 % |
| 14.2 | 500 | 44 % |

In addition, the aerial photographs indicated that numerous side channels which were inundated at flows of 29.2 $m^3$/sec (1030 cfs) were dry when flows were reduced to 11.6 $^3$/sec (410 cfs).

In summary, the above data indicate that discharges in the Nechako River below 56.5 $m^3$/sec (2000 cfs) and in particular below 42.5 $m^3$/sec (1500 cfs), will result in significant reduction in the wetted river width and consequently in the nearshore rearing habitat. This habitat, based on fish capture data, is known to be well utilized by juvenile chinook.

Aerial photographs and side channel evaluation

Aerial photo sequences taken between Cheslatta Falls and Diamond Island were analysed to determine the effect of different discharge levels on the length of wetted side channels. The lengths of wetted side channels in each class category (1, 1B, 2, 2B; see methods for

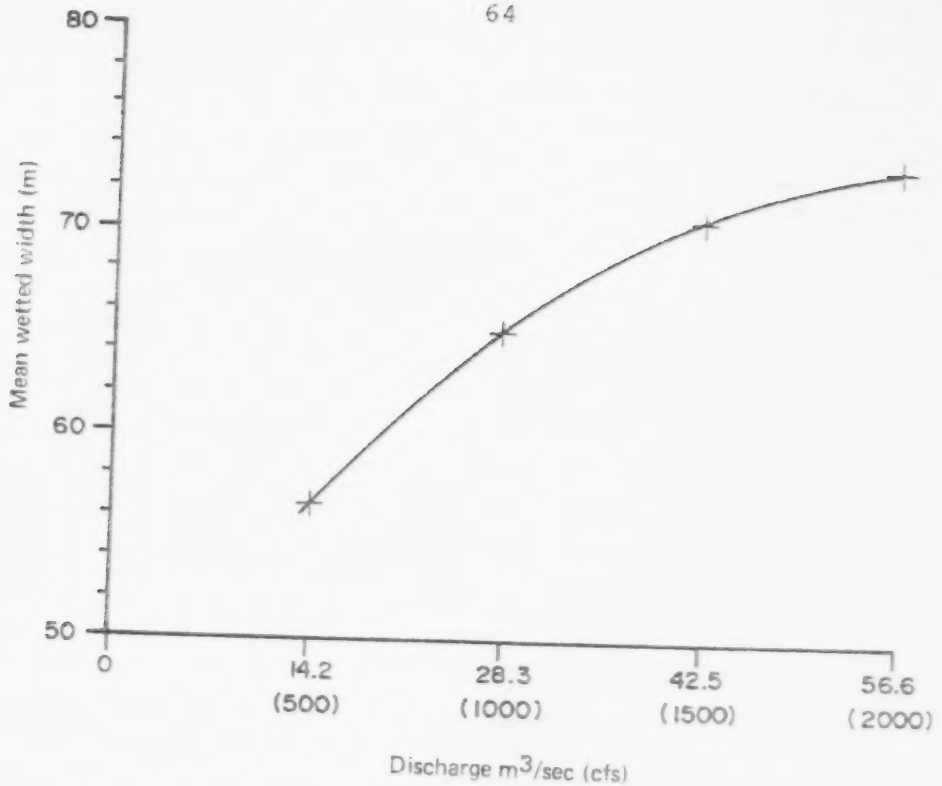



Fig. 31. Relationship between mean wetted width in nine single channel sections and discharge, Nechako River, 1982.

Table 16. Relationship between wetted width in single channel sections and discharge, Nechako River, 1982.

| Section No. | Discharge $m^3$/sec (cfs) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 56.6 (2000) | 42.5 (1500) | | 28.3 (1000) | | 14.2 (500) | |
| | Width (m) | Width (m) | % Reduction[a] | Width (m) | % Reduction[a] | Width (m) | % Reduction[a] |
| 1 | 71.0 | 67.1 | 6 | 60.4 | 15 | 49.4 | 30 |
| 2 | 54.9 | 53.0 | 3 | 43.3 | 21 | 34.1 | 38 |
| 3 | 63.4 | 61.6 | 3 | 56.1 | 12 | 48.8 | 23 |
| 4 | 100.9 | 95.1 | 6 | 82.3 | 18 | 65.2 | 35 |
| 5 | 72.5 | 70.4 | 3 | 67.1 | 8 | 60.7 | 16 |
| 6 | 68.3 | 66.1 | 3 | 62.8 | 8 | 55.2 | 19 |
| 7 | 87.5 | 86.3 | 1 | 84.4 | 3 | 81.1 | 7 |
| 8 | 47.5 | 45.7 | 4 | 43.6 | 8 | 41.5 | 13 |
| 9 | 93.6 | 89.0 | 5 | 84.1 | 10 | 73.2 | 22 |
| Mean | 73.3 | 70.5 | 4 | 64.9 | 11 | 56.6 | 23 |

[a] Reduction from a base value of 56.6 $m^3$/sec (2000 cfs).

description) at different discharges in Nechako River are shown in Figure 32 and Appendix 29.

The results indicated that at discharges increasing from 11.6 $m^3$/sec (410 cfs) to 56.6 $m^3$/sec (2000 cfs), the total length of wetted side channels in the class 1 and 2 categories increased. At the same time, the length of backwater channels without through flow (classes 1B and 2B) increased slightly at discharges between 11.6 $m^3$/sec (410 cfs) and 25.2 $m^3$/sec (890 cfs) but had declined significantly at 56.6 $m^3$/sec (2000 cfs) as these had become through flow channels.

## ADULT CHINOOK SALMON 1980, 1981, 1982

### Spawner abundance and distribution

The total daily chinook spawner counts made in Septembr 1980 for the Nechako mainstem between Cheslatta Falls and Vanderhoof are shown below:

| DFO observations | | Envirocon observations | |
|---|---|---|---|
| Date | No. fish | Date | No. fish |
| September 2 | 898 | September 4 | 340 |
| September 9 | 1,438 | September 8 | 1,409 |
| September 16 | 1,508 | September 12 | 1,640 |
| September 23 | 1,189 | September 16 | 1,191 |
| | | September 20 | 1,453 |
| | | September 24 | 923 |
| | | September 29 | 233 |
| | | October 2 | 106 |

The DFO counts included migrating, spawning and dead chinook adults; additional aerial counts made by Envirocon Ltd. included only live spawners observed on redds. The latter data were suitable for estimating the total chinook population spawning in the Nechako mainstem using the Neilson and Geen (1981) method. Their method incorporates estimates of mean female residence time on redds. In 1980, this value was 16.3 days prior to September 13 and 13.9 days after September 13 (Envirocon 1981b).

The aerial spawning counts obtained each day were plotted against time and the area under the curve was determined. Spawner estimates before and after September 13 were then divided by the appropriate mean female residence time on redds, yielding a total chinook escapement estimate of 2,023 fish (95% confidence limits 1,779 - 2,123; Envirocon, unpublished data).

In 1981, when only two helicopter flights over the Nechako River were made, 400 spawners (none dead) and 151 spawners (including 58 dead) were counted on September 17 and 24 respectively. The Fisheries Officer's estimate was approximately 500 chinook. These numbers are probably underestimates due to turbid water conditions.Incidental fish sightings and observations made during an egg-take attempted in September indicated that peak spawning occurred around September 12.

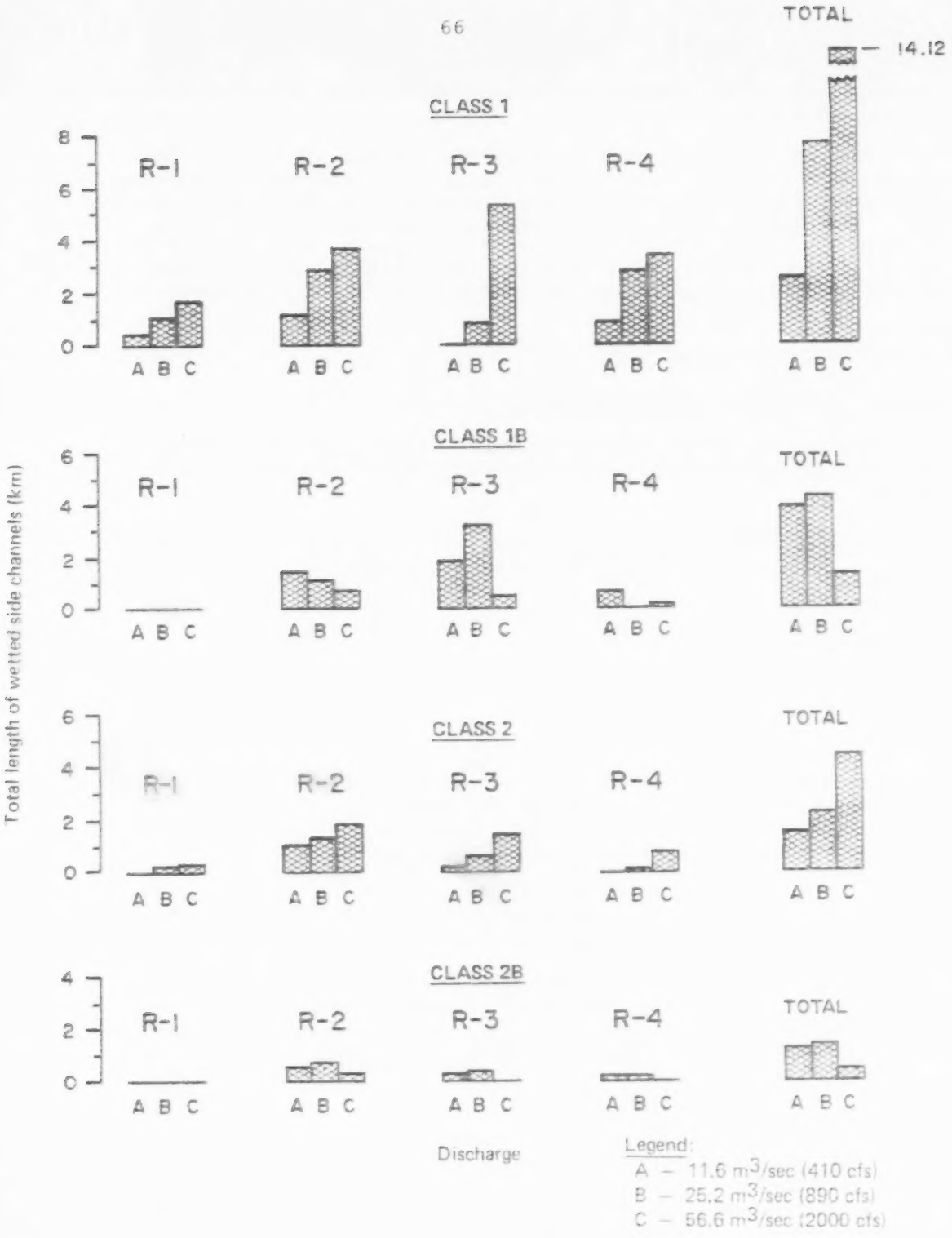



Fig. 32. Total length of wetted side channels in each class (1, 1B, 2, 2B) at different discharges (A, B & C) in four reaches (R) of Nechako River between Cheslatta Falls and Fort Fraser, 1982.

In 1982, 1,187 spawners (including 237 dead) and 1,003 spawners (including 237 dead) were counted on September 14 and 20 respectively. The Fisheries Officer's estimate was approximately 1,300 chinook. Incidental fish sighting and observations made during an egg-take in September indicated that peak spawning occurred between September 8 and 12.

The 1980 spawner distribution of chinook in the Nechako River above Vanderhoof, as indicated by aerial counts during September 2, 9 and 16, showed largest fish concentrations between the Twin and Cutoff creeks (Fig. 33, Appendix 30). September 23 data were not included in the distribution study in order to avoid the use of increasing dead fish counts.

Estimated spawner abundance in 1980 in three major river sections between Cheslatta Falls and Vanderhoof were as follows:

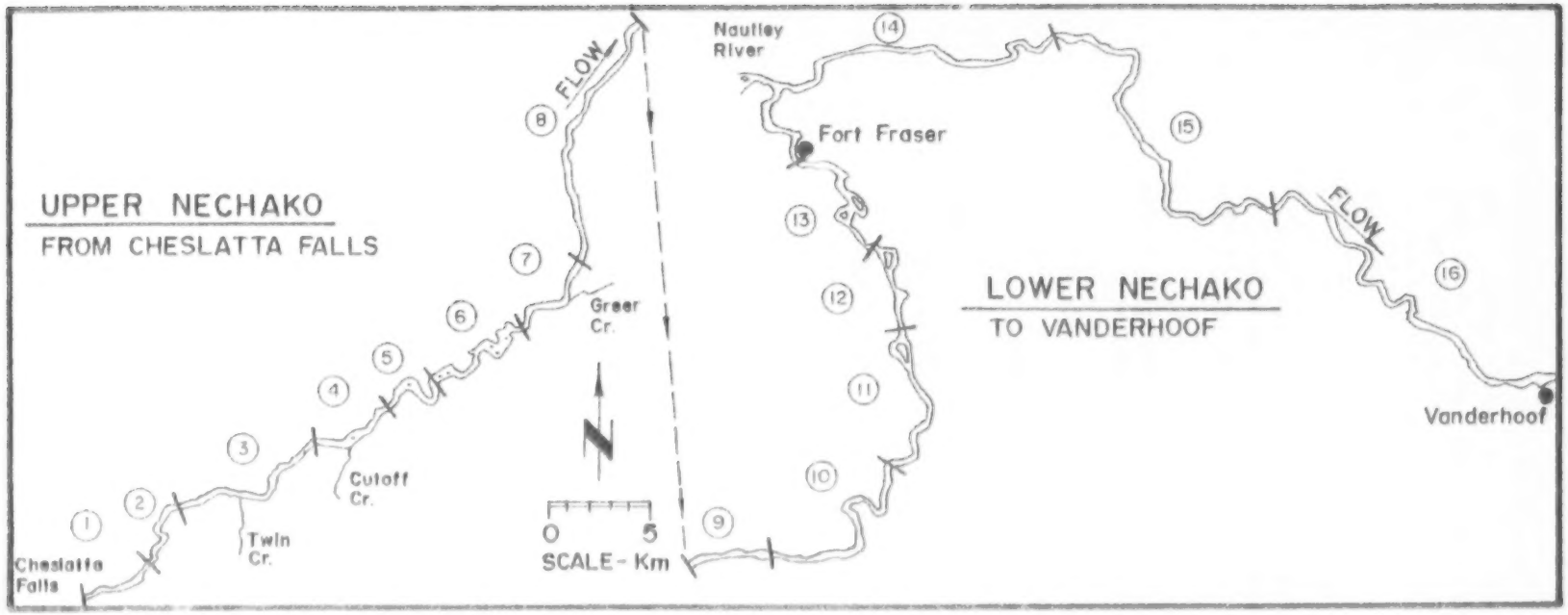
| River section | Section length (km) | Total spawners (mean count for Sept. 2, 9 & 16) (No.) | (%) | Spawner concentration (No./km) | Envirocon Ltd. data (No.) | (%) |
|---|---|---|---|---|---|---|
| Cheslatta Falls to Cutoff Cr. | 15.8 | 484 | 37.7 | 30.6 | 870 | 43.0 |
| Cutoff Cr. to Nautley R. | 70.7 | 686 | 53.5 | 9.7 | 985 | 48.7 |
| Nautley R. to Vanderhoof | 53.3 | 113 | 8.8 | 2.1 | 168 | 8.3 |
| Total | - | 1283 | 100% | - | 2023 | 100% |

Spawner concentration was by far the highest above the Cutoff Creek confluence where about 40% of total spawners were counted, and lowest below the Nautley River confluence where only about 9% of total spawners were counted. Envirocon Ltd. obtained similar 1980 spawner distribution estimates using spawner counts and female residence times (see above). This spawning distribution is similar to that observed by DFO in 1974 (Dept. Fish. Env.1979b) and confirms the importance of the Nechako River upstream of Cutoff Creek as the principal spawning area. However, the above DFO spawning data underestimate the actual numbers of spawners and give only an indication of relative fish abundance.

Spawner distribution could not be determined from the limited 1981 and 1982 data.

Adult size, fecundity and egg retention

Length frequency data for chinook salmon dead-pitched in the Nechako River during September 1980, 1981 and 1982 are presented in Figure 34 and Appendices 31, 32 and 33. Mean postorbital-hypural length (± 1 S.E.) of chinook spawners by sex and year was as follows:



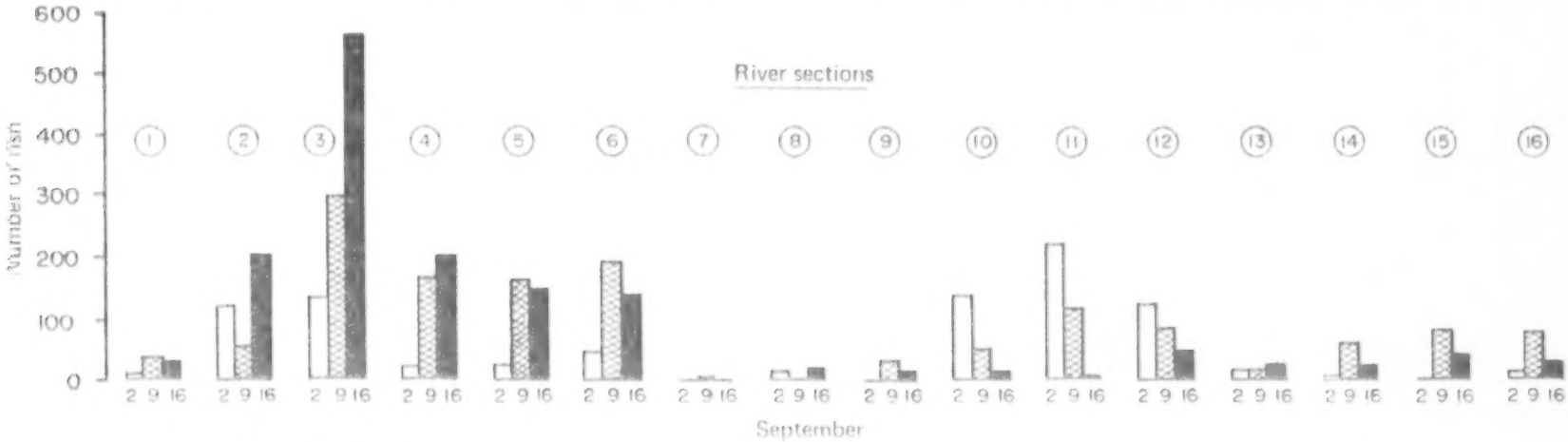




Fig. 33. Distribution of chinook spawners in Nechako River from Cheslatta Falls to Vanderhoof, September 1980 (upper insert shows location of river sections 1-16).

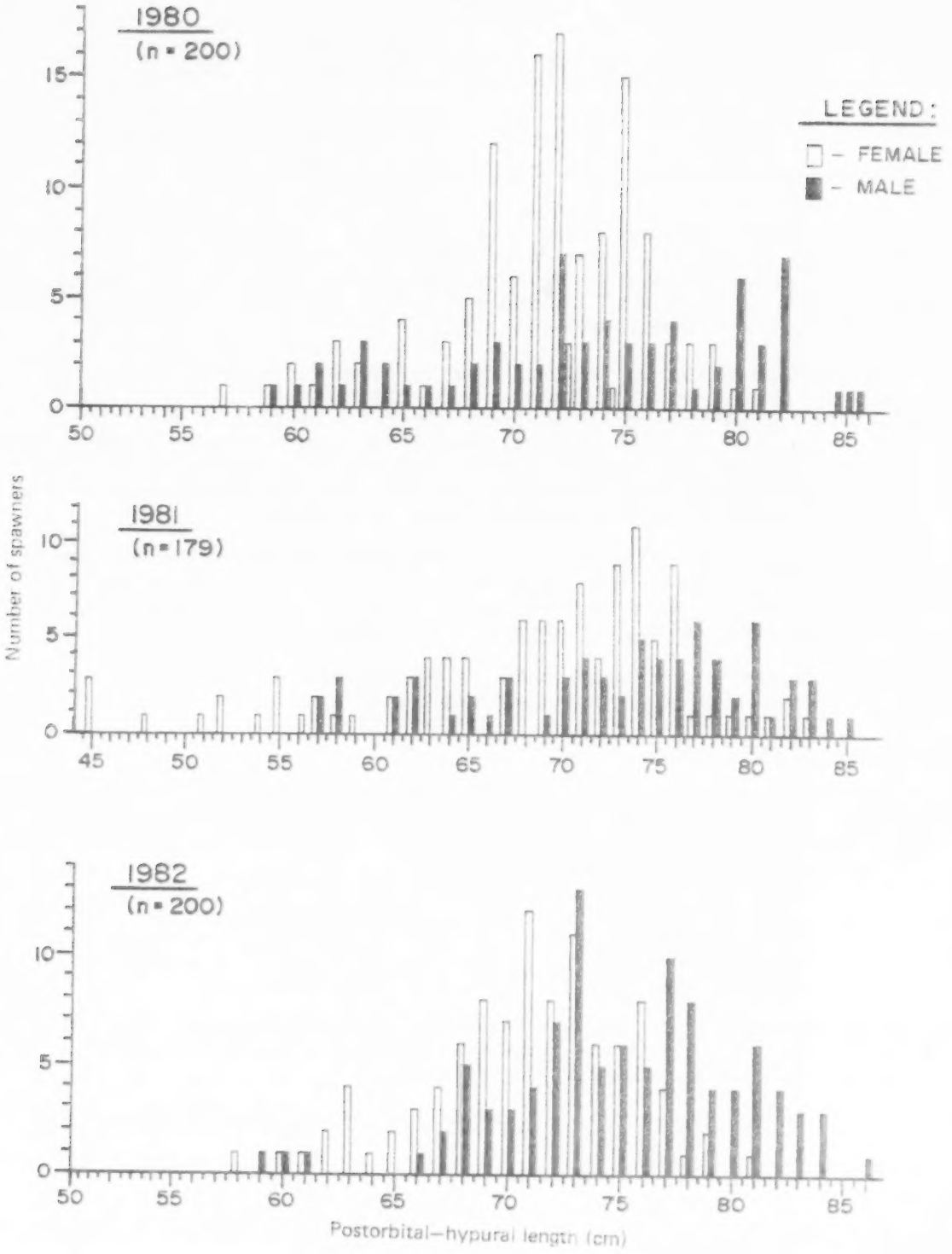



Fig. 34. Length frequency distribution of chinook spawners, Nechako River, 1980, 1981, 1982 (n gives sample size).

| Year | Total No. fish | Length (cm) Males | Females | Total |
|---|---|---|---|---|
| 1980 | 200 | 71.8 ± 1.2 | 71.4 ± 0.4 | 71.5 ± 0.5 |
| 1981 | 179 | 72.2 ± 1.0 | 68.4 ± 0.8 | 70.0 ± 0.6 |
| 1982 | 200 | 75.1 ± 0.5 | 70.3 ± 0.6 | 72.7 ± 0.4 |
| Mean | | 73.0 | 70.0 | 71.4 |

Generally, mean spawner size was similar for the three years, with males being slightly larger than females. The 1980 mean weight (± 1 S.E.) of chinook spawners by sex was 8.1 ± 0.8 kg for males (mean length ± 1 S.E. 72.5 ±3.7 cm)and 6.2 ± 0.4 kg for females (mean length ± 1 S.E. 70.7 ± 1.5 cm; Appendix 31).

Mean fecundity in 1980 of two unspawned females measuring 71 cm in postorbital-hypural length, was approximately 5000 eggs. By comparison, mean fecundity of three Nechako females averaging 85 cm in length, sampled in 1979 by EVS, was 5,932 eggs (range 5,284 - 7,200) (Olmsted, Whelen and Vigers 1980). Since the overall mean length of Nechako females is approximately 70 cm, the 5000 eggs per female is considered to be a representative mean fecundity.

Egg retention in 1980 for 110 females averaged 12 eggs (range 0 - 850 eggs). In 1981, only two out of 107 females examined retained eggs (1 egg and 6 eggs respectively). In 1982, egg retention for 100 females averaged 10 eggs (range 0 - 350 eggs).

Sex composition could not be determined since the samples were not representative of the entire population.

Adult age composition

Age composition data for the 1980, 1981 and 1982 Nechako chinook spawners are summarized in Table 17 and are presented in detail in Appendices 31, 32 and 33. In all three years, the majority of fish analyzed were 4 and 5 years old:

| Year | % Age 4 and 5 |
|---|---|
| 1980 | 98.4 |
| 1981 | 96.8 |
| 1982 | 98.9 |

A small component of age $6_2$ fish was also observed in 1981 and 1982. In addition, most of the adults analyzed spent one full year in freshwater prior to seaward migration:

| Year | % Adults with one year in freshwater |
|---|---|
| 1980 | 87.8 |
| 1981 | 95.0 |
| 1982 | 100.0 |

In all three years, males and females generally showed a similar age structure.

Table 17. Age composition of chinook spawners by sex and year, Nechako River, 1980, 1981 and 1982 (n gives total number of fish with readable scales).

| | (n) | AGE[a] $3_1$ | $3_2$ | $4_1$ | $4_2$ | $5_1$ | $5_2$ | $6_2$ | Resorbed |
|---|---|---|---|---|---|---|---|---|---|
| **1980** | | | | | | | | | |
| No. males | (113) | 0 | 2 | 7 | 9 | 2 | 93 | 0 | 10 |
| No. females | (67) | 1 | – | 12 | 12 | 0 | 42 | 0 | 10 |
| Total | (180) | 1 | 2 | 19 | 21 | 2 | 135 | 0 | 20 |
| % Age | | 0.5 | 1.1 | 10.6 | 11.7 | 1.1 | 75.0 | 0 | |
| % of fish aged sub 2 = (158/180) x 100 = 87.8% | | | | | | | | | |
| **1981** | | | | | | | | | |
| No. males | (62) | 0 | 0 | 3 | 10 | 0 | 47 | 2 | 10 |
| No. females | (99) | 1 | 1 | 3 | 28 | 1 | 64 | 1 | 7 |
| Total | (161) | 1 | 1 | 6 | 38 | 1 | 111 | 3 | 17 |
| % Age | | 0.6 | 0.6 | 3.7 | 23.6 | 0.6 | 68.9 | 1.9 | |
| % of fish aged sub 2 = (153/161) x 100 = 95.0% | | | | | | | | | |
| **1982** | | | | | | | | | |
| No. males | (90) | 0 | 0 | 0 | 4 | 0 | 84 | 2 | 10 |
| No. females | (88) | 0 | 0 | 0 | 14 | 0 | 74 | 0 | 12 |
| Total | (178) | 0 | 0 | 0 | 18 | 0 | 158 | 2 | 22 |
| % Age | | 0 | 0 | 0 | 10.1 | 0 | 88.8 | 1.1 | |
| % of fish age sub 2 = 100% | | | | | | | | | |

[a] Subscript indicates the number of years spent in freshwater prior to seaward migration; for example, age $3_2$ chinook migrated to sea in its second year.

Age composition comparable to the above was also observed for Nechako chinook sampled in 1974 (Dept. Fish. Env. 1979b) where 74% of the spawners examined were age $4_2$ or $5_2$. The most significant difference between the 1974, and 1980 to 1982 spawners was that in 1974, age $3_2$ fish constituted 20.9% of the sample, but they were a minor age component from 1980 to 1982. The consistently high proportion of chinook spawners aged sub 2, observed in 1974, 1980, 1981 and 1982 is indicative of the importance of overwintering habitat for chinook juveniles.

## INCUBATION STUDIES 1980, 1982

### Physical measurements of spawned chinook redds 1980

Typical redd profiles surveyed in 1980 are shown in Figure 35. Profile measurements taken at an approximate discharge of 34.0 $m^3$/sec (1200 cfs) are summarized in Table 18. Generally, in the upper spawning area, water depth over the crest was about 39 cm and over the redd 58 cm. In the lower spawning area, water depth over the crest was about 46 cm and over the redd 75 cm. Nose velocity averaged 0.7 m/sec for redds in both the upper and lower spawning areas.

In order to determine the effect of reduced discharges in the Nechako River on water depth over the active redds surveyed in 1980, the 1974 DFO rating curves were utilized. Since the Nechako River had changed very little during this period, it was felt that these curves were still applicable. To confirm this, several water surface elevations at known discharges were measured during the 1980 survey and the data were found to compare favourably with the rating curves established in 1974. It was therefore possible to determine for decreasing discharges, water depths over the tailspill and crest of redds spawned in 1980.

All 39 of the redds surveyed in the prime upper and lower spawning areas were grouped according to the cross-sectional rating curve which would best represent changes in their stage-discharge. Since the 1980 spawning measurements were taken at 33.7 $m^3$/sec (1,190 cfs), it was possible to determine water depth over each redd crest at regular discharge intervals down to 9.9 $m^3$/sec (350 cfs). The percentage of surveyed redds equal to or shallower than any given depth for a series of discharges from 33.7 $m^3$/sec (1,190 cfs) to 9.9 $m^3$/sec (350 cfs) is shown in Figure 36. As discharge declined, the percentage of surveyed redds that remained covered to a given depth declined rapidly (Fig. 36). For example, at 33.7 $m^3$/sec (1,190 cfs), 20% of the redds surveyed would be covered by water to a depth of less than 30 cm and at 9.9 $m^3$/sec (350 cfs) 94% of the reds would be under less than 30 cm of water.

Using the above data it was also possible to determine the effect reduced flows would have on water depth over each of the surveyed crests if spawning occurred at lower discharges. Two hypothetical spawning discharges of 28.3 $m^3$/sec (1000 cfs) and 19.8 $m^3$/sec (700 cfs) were analysed and the water depth over each crest at discharges of 14.2 $m^3$/sec (500 cfs) and 9.9 $m^3$/sec (350 cfs) was determined.

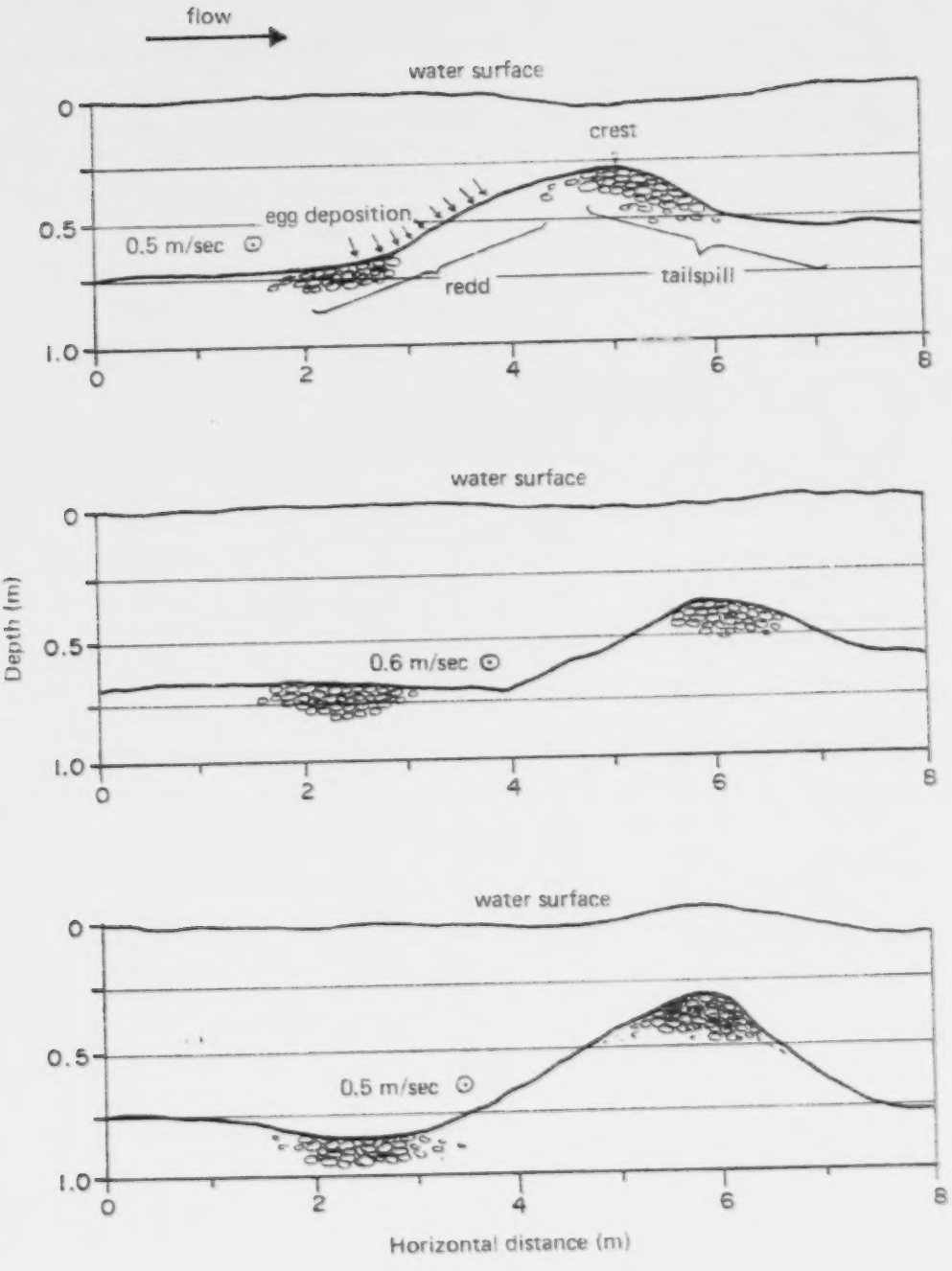



Fig. 35. Typical redd profiles during spawning, Nechako River, 1980 (point velocity is indicated by ⊙).

Table 18. Redd profile measurements, Nechako River, September 1980 (approximate discharge 34.0 $m^3$/sec (1200 cfs)).

| Redd No. | Nose velocity[a] (m/sec) | (fps) | Depth of crest (m) | Depth of redd (m) |
|---|---|---|---|---|
| **Upper spawning area** | | | | |
| 1 | 0.7 | 2.3 | 0.27 | 0.52 |
| 2 | 0.6 | 2.0 | 0.37 | 0.70 |
| 3 | 0.7 | 2.2 | 0.37 | 0.55 |
| 4 | 0.6 | 2.0 | 0.37 | 0.73 |
| 5 | 0.6 | 2.1 | 0.49 | 0.76 |
| 6 | 0.7 | 2.2 | 0.40 | 0.67 |
| 7 | 0.6 | 2.1 | 0.40 | 0.55 |
| 8 | 0.7 | 2.2 | 0.46 | 0.49 |
| 9 | 0.9 | 2.9 | 0.27 | 0.46 |
| 10 | 1.1 | 3.5 | 0.76 | 0.85 |
| 11 | 0.8 | 2.5 | 0.40 | 0.73 |
| 12 | 0.7 | 2.3 | 0.43 | 0.85 |
| 13 | 0.7 | 2.2 | 0.24 | 0.37 |
| 14 | 0.9 | 2.8 | 0.49 | 0.70 |
| 15 | 0.9 | 3.0 | 0.55 | 0.43 |
| 16 | 0.9 | 2.8 | 0.30 | 0.46 |
| 17 | 0.8 | 2.7 | 0.52 | 0.55 |
| 18 | 0.6 | 2.0 | 0.24 | 0.49 |
| 19 | 0.6 | 2.0 | 0.34 | 0.52 |
| 20 | 0.8 | 2.7 | 0.52 | 0.73 |
| 21 | 0.6 | 2.1 | 0.24 | 0.52 |
| 22 | 0.8 | 2.7 | 0.27 | 0.43 |
| 23 | 0.6 | 2.0 | 0.37 | 0.52 |
| 24 | 0.4 | 1.7 | 0.21 | 0.46 |
| 25 | 0.6 | 1.9 | 0.37 | 0.52 |
| Mean (1-25) | 0.7 | 2.4 | 0.39 | 0.58 |
| **Lower spawning area** | | | | |
| 26 | 0.7 | 2.3 | 0.43 | 0.64 |
| 27 | 0.7 | 2.2 | 0.64 | 0.76 |
| 28 | 0.6 | 2.0 | 0.40 | 0.70 |
| 29 | 0.8 | 2.7 | 0.55 | 0.91 |
| 30 | 0.7 | 2.2 | 0.46 | 0.70 |
| 31 | 0.6 | 2.0 | 0.46 | 0.70 |
| 32 | 0.5 | 1.6 | 0.30 | 0.67 |
| 33 | 0.6 | 2.1 | 0.30 | 0.67 |
| 34 | 0.6 | 1.9 | 0.46 | 0.85 |
| 35 | 0.7 | 2.3 | 0.55 | 0.85 |
| 36 | 0.7 | 2.3 | 0.55 | 0.85 |
| 37 | 0.7 | 2.2 | 0.46 | 0.73 |
| 38 | 0.8 | 2.5 | 0.49 | 0.67 |
| 39 | 0.8 | 2.5 | 0.37 | 0.76 |
| Mean (26-39) | 0.7 | 2.2 | 0.46 | 0.75 |
| **Random spawning areas** | | | | |
| 40 | 0.3 | 1.1 | 0.15 | 0.46 |
| 41 | 0.5 | 1.6 | 0.34 | 0.79 |
| 42 | 0.5 | 1.6 | 0.30 | 0.61 |
| 43 | 0.7 | 2.2 | 0.34 | 0.61 |
| 44 | 0.6 | 1.9 | 0.15 | 0.40 |
| 45 | 0.6 | 1.9 | 0.18 | 0.46 |
| 46 | 0.7 | 2.3 | 0.58 | 0.70 |
| 47 | 0.7 | 2.2 | 0.52 | 0.82 |
| 48 | 0.7 | 2.4 | 0.40 | 0.67 |
| Mean (40-48) | 0.6 | 1.9 | 0.33 | 0.61 |

[a] 12 cm above the bottom.

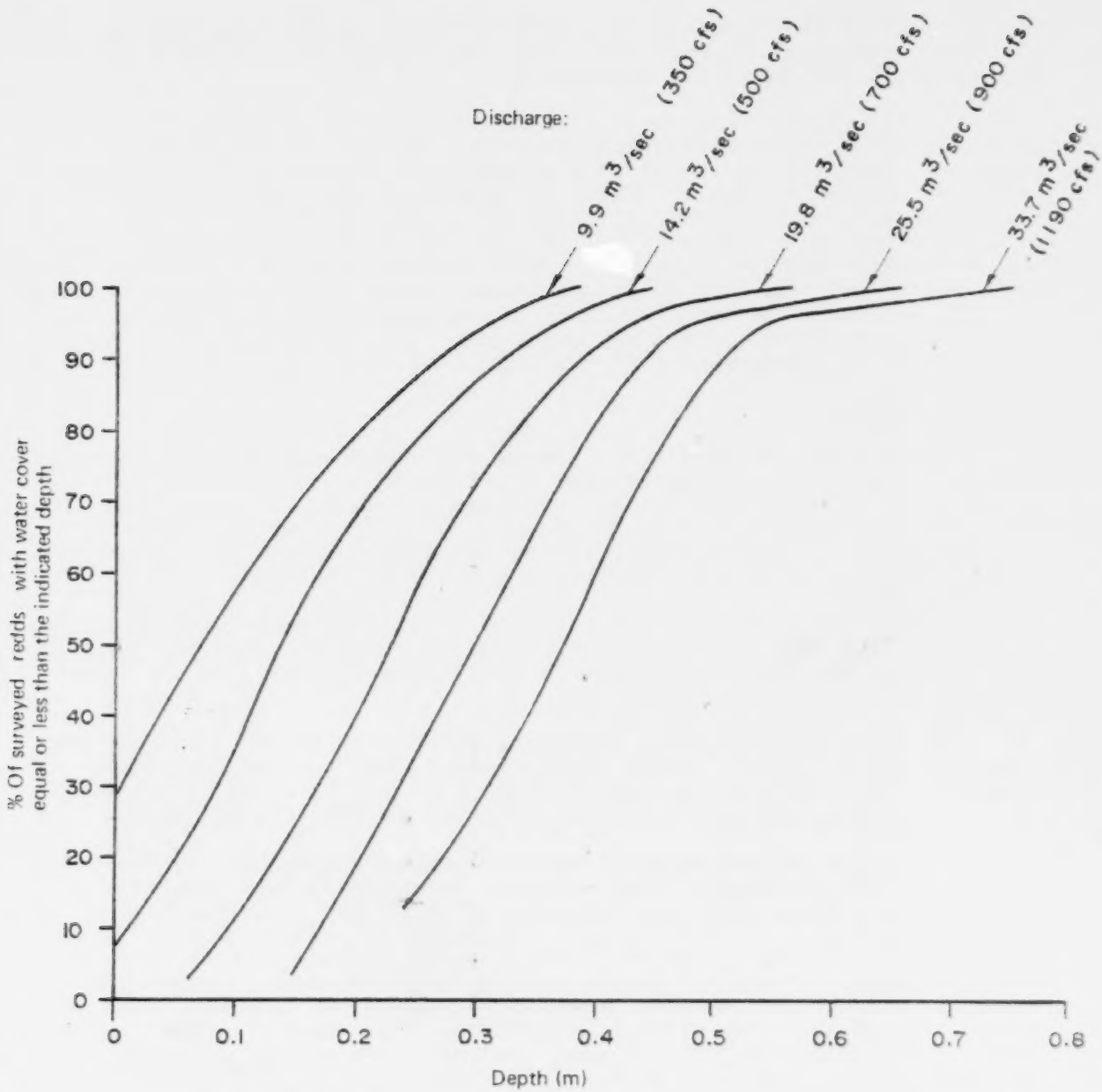



Fig.36. Percent of surveyed redds at different discharges with water cover equal or less than the indicated depth, Nechako River, 1980.

Since spawning was observed at depths of 24 cm during the 1980 survey, the above calculations were made with the assumption that this was the minimum depth suitable for spawning.

At 28.3 $m^3$/sec (1000 cfs), 32 (or 82%) out of 39 redds originally surveyed would have sufficient depth ($\geq$ 24 cm) to be suitable for spawning (Table 19) while at 19.8 $m^3$/sec (700 cfs) only 19 redds (49%) would be suitable (Table 20). No actual dewatering of the crests would occur in either case if flows were reduced to 14.2 $m^3$/sec (500 cfs) although when reduced from 28.3 $m^3$/sec (1000 cfs) several redds would be very shallow (6.0 cm). When reduced from 28.3 $m^3$/sec (1000 cfs) to 9.9 $m^3$/sec (350 cfs), 10 crests would actually be dewatered and several would be very shallow. No dewatering of the crests would result at 9.9 $m^3$/sec (350 cfs) since only the redds located in deeper water would be spawnable at 19.8 $m^3$/sec (700 cfs).

Egg development

Examination of egg plant boxes in 1980 showed that Nechako chinook eggs were eyed by October 10 (280 °C - days, based on mean daily water temperatures at Irvine's Lodge incubation site; Appendix 34), and started to hatch by November 5 (511 °C - days). Hatching at all egg plant sites was completed by November 18 (594 °C - days) and alevins left boxes planted at Irvine's Lodge by this date.

In 1982, examination of egg plant boxes placed in artificial redds verified the 1980 eyeing and hatching results. All but four of the 750 eggs examined on November 9, 1982 were hatched (592 °C - days; Appendix 35).

The above developmental rates are comparable to the hatching data provided by D. McNeil (DFO, pers. comm.) for the DFO hatchery in Kitimat. The hatchery chinook were eyed at 280 °C - days, hatched at 480 to 540 °C - days and were ponded at 900 to 960 °C - days.

Completion of hatching of Nechako chinook eggs by mid-November 1980 and 1982 indicates that alevins were mobile and able to move through the gravel prior to the onset of cold winter weather, thereby avoiding freezing temperatures. However in other years, colder temperatures following spawning could delay hatching of chinook eggs until December. This may result in high egg and alevin mortalities if water levels in the Nechako River are reduced to a point where the redds are exposed to frost. Therefore, in order to avoid frost related mortality of chinook eggs through redd exposure, given that fall and winter temperatures may drop sharply and unpredictably, water in the Nechako River should be maintained at sufficiently high levels throughout the incubation period which may vary in length .

Effect of gravel planting depth and redd type on egg survival

The 1980 survival rates of chinook eggs planted between September 12 and 17 at gravel depths of 4 cm, 15 cm, 20 cm and 30 cm are given in Table 21 (due to weather conditions only 16 out of 24 planted boxes were examined for egg survival). Mean egg-to-alevin survival on November 5 to 18 at each gravel depth was as follows:

Table 19. Water depth over surveyed redds at a hypothetical spawning discharge of 28.3 $m^3$/sec (1000 cfs); X indicates suitability for spawning since depth is $\geq$ 24 cm.

| Redd No. | Depth of crest at 28.3 $m^3$/sec (1000 cfs) (m) | Suitable | Depth of crest at 14.2 $m^3$/sec (500 cfs) (m) | Depth of crest at 9.9 $m^3$/sec (350 cfs) (m) |
|---|---|---|---|---|
| Upper spawning area | | | | |
| 1 | 0.20 | – | – | – |
| 2 | 0.29 | X | 0.06 | 0 |
| 3 | 0.29 | X | 0.06 | 0 |
| 4 | 0.26 | X | 0.06 | 0 |
| 5 | 0.41 | X | 0.18 | 0.09 |
| 6 | 0.32 | X | 0.09 | 0 |
| 7 | 0.35 | X | 0.12 | 0.03 |
| 8 | 0.38 | X | 0.15 | 0.06 |
| 9 | 0.20 | – | – | – |
| 10 | 0.69 | X | 0.46 | 0.37 |
| 11 | 0.38 | X | 0.15 | 0.06 |
| 12 | 0.35 | X | 0.12 | 0.03 |
| 13 | 0.17 | – | – | – |
| 14 | 0.44 | X | 0.29 | 0.23 |
| 15 | 0.20 | – | – | – |
| 16 | 0.26 | X | 0.11 | 0.05 |
| 17 | 0.50 | X | 0.35 | 0.29 |
| 18 | 0.20 | – | – | – |
| 19 | 0.29 | X | 0.14 | 0.08 |
| 20 | 0.50 | X | 0.35 | 0.29 |
| 21 | 0.20 | – | – | – |
| 22 | 0.26 | X | 0.11 | 0.05 |
| 23 | 0.32 | X | 0.17 | 0.11 |
| 24 | 0.20 | – | – | – |
| 25 | 0.35 | X | 0.20 | 0.14 |
| Mean (1-25) | 0.32 | X | 0.18 | 0.10 |

| Redd No. | Depth of crest at 28.3 $m^3$/sec (1000 cfs) (m) | Suitable | Depth of crest at 14.2 $m^3$/sec (500 cfs) (m) | Depth of crest at 9.9 $m^3$/sec (350 cfs) (m) |
|---|---|---|---|---|
| Lower spawning area | | | | |
| 26 | 0.38 | X | 0.21 | 0 |
| 27 | 0.59 | X | 0.43 | 0.21 |
| 28 | 0.35 | X | 0.18 | 0 |
| 29 | 0.50 | X | 0.34 | 0.12 |
| 30 | 0.41 | X | 0.24 | 0.03 |
| 31 | 0.41 | X | 0.24 | 0.03 |
| 32 | 0.26 | X | 0.09 | 0 |
| 33 | 0.26 | X | 0.09 | 0 |
| 34 | 0.41 | X | 0.24 | 0.03 |
| 35 | 0.50 | X | 0.34 | 0.12 |
| 36 | 0.32 | X | 0.15 | 0 |
| 37 | 0.41 | X | 0.24 | 0.03 |
| 38 | 0.44 | X | 0.27 | 0.06 |
| 39 | 0.32 | X | 0.15 | 0 |
| Mean (26-39) | 0.40 | X | 0.23 | 0.05 |

At 28.3 $m^3$/sec (1000 cfs) – 82% of spawned redds are suitable for spawning (min. depth 24 cm).

At 14.2 $m^3$/sec (500 cfs) – no crest dewatered (min. depth 6 cm).

At 9.9 $m^3$/sec (350 cfs) – 10 crests dewatered.

Table 20. Water depth over surveyed redds at a hypothetical spawning discharge of 19.8 $m^3$/sec (700 cfs); X indicates suitability for spawning since depth is $\geq$ 24 cm.

| Redd No. | Depth of crest at 19.8 $m^3$/sec (700 cfs) (m) | Suitable | Depth of crest at 14.2 $m^3$/sec (500 cfs) (m) | Depth of crest at 9.9 $m^3$/sec (350 cfs) (m) |
|---|---|---|---|---|
| 1 | 0.08 | – | – | – |
| 2 | 0.17 | – | – | – |
| 3 | 0.17 | – | – | – |
| 4 | 0.14 | – | – | – |
| 5 | 0.29 | X | 0.18 | 0.09 |
| 6 | 0.20 | – | – | – |
| 7 | 0.23 | – | – | – |
| 8 | 0.26 | X | 0.15 | 0.06 |
| 9 | 0.08 | – | – | – |
| 10 | 0.56 | X | 0.46 | 0.37 |
| 11 | 0.26 | X | 0.15 | 0.06 |
| 12 | 0.23 | – | – | – |
| 13 | 0.05 | – | – | – |
| 14 | 0.37 | X | 0.29 | 0.23 |
| 15 | 0.12 | – | – | – |
| 16 | 0.18 | – | – | – |
| 17 | 0.41 | X | 0.35 | 0.29 |
| 18 | 0.12 | – | – | – |
| 19 | 0.21 | – | – | – |
| 20 | 0.41 | X | 0.35 | 0.29 |
| 21 | 0.12 | – | – | – |
| 22 | 0.18 | – | – | – |
| 23 | 0.24 | X | 0.17 | 0.11 |
| 24 | 0.12 | – | – | – |
| 25 | 0.27 | X | 0.20 | 0.14 |
| Mean (1-25) | 0.22 | – | 0.26 | 0.18 |
| 26 | 0.27 | X | 0.21 | 0.17 |
| 27 | 0.50 | X | 0.44 | 0.38 |
| 28 | 0.26 | X | 0.20 | 0.44 |
| 29 | 0.41 | X | 0.35 | 0.29 |
| 30 | 0.32 | X | 0.26 | 0.20 |
| 31 | 0.32 | X | 0.26 | 0.20 |
| 32 | 0.17 | – | – | – |
| 33 | 0.17 | – | – | – |
| 34 | 0.32 | X | 0.26 | 0.20 |
| 35 | 0.41 | X | 0.35 | 0.29 |
| 36 | 0.23 | – | – | – |
| 37 | 0.32 | X | 0.26 | 0.21 |
| 38 | 0.35 | X | 0.29 | 0.24 |
| 39 | 0.23 | – | – | – |
| Mean (26-39) | 0.31 | X | 0.29 | 0.26 |

At 19.8 $m^3$/sec (700 cfs) – 49% of spawned redds are suitable for spawning (min. depth 24 cm).

At 14.2 $m^3$/sec (500 cfs) – no crest dewatered (min. depth 15 cm).

At 9.9 $m^3$/sec (350 cfs) – no crest dewatered (min depth 6 cm).

Table 21. Survival rates of planted chinook eggs, Nechako River, 1980.

| Egg plant No. | Box No. | Depth of gravel planted (cm) | % of eggs alive of those planted |
|---|---|---|---|
| Milk tray No. 1 November 5, 1980 | 1 | 4 | 33 |
| | 2 | 4 | 27 |
| | 3 | 15 | 88 |
| | 4 | 15 | 46 |
| | 5 | 30 | 72 |
| | 6 | 30 | 34 |
| Milk tray No. 2 November 18, 1980 | 1 | 4 | 46 |
| | 2 | 4 | 49 |
| | 3 | 15 | 74 |
| | 4 | 15 | 19 |
| | 5 | 30 | 77 |
| | 6 | 30 | 89 |
| Cutoff Creek redd No. 3 November 5 and 18 | 1 | 20 | 100 |
| | 2 | 20 | 97 |
| | 3 | 30 | 100 |
| | 4 | 30 | 100 |

| Gravel depth | Mean survival (range) |
|---|---|
| 4 cm | 39% (27% - 49%) |
| 15 cm | 57% (19% - 88%) |
| 20 cm | 99% (97% - 100%) |
| 30 cm | 79% (34% - 100%) |

If it is assumed that planting methods were the same for all egg boxes, the above data suggest that the gravel depth most conducive to high chinook egg survival was 20 cm. Freeze core samples taken in 1980 indicated that eggs in natural redds were located between 15 cm and 30 cm, confirming that the optimum gravel depth for egg survival may be around 20 cm.

The 1982 survival rates of chinook eggs planted on September 16 at gravel depths of 15 cm and 25 cm are given in Table 22. Mean egg-to-alevin survival at each gravel depth on November 25 was as follows:

| Gravel depth | Mean survival (range) |
|---|---|
| 15 cm | 81% (65% - 100%) |
| 25 cm | 76% (60% - 100%) |

Mean egg-to-alevin survival in different redd types on November 25 was as follows:

| Redd type | Mean survival (range) |
|---|---|
| Artificial (shallow) | 96% (88% - 100%) |
| Artificial (within criteria) | 79% (64% - 94%) |
| Natural (within criteria) | 61% (50% - 70%) |

Mean percentages of alevins by redd type that migrated from the boxes into gravel by November 9 and 25 were as follows:

| | Mean migrated alevins (range) | |
|---|---|---|
| Redd type | November 9 | November 25 |
| Artificial (shallow) | 32% (0%-96%) | 66% (50%-96%) |
| Artificial (within criteria) | 74% (0%-100%) | 94% (76%-100%) |
| Natural (within criteria) | 61% (28%-96%) | 95% (85%-100%) |

In summary, the 1982 incubation results showed similar egg survival rates for both the 15 cm and 25 cm gravel depths; survivals were higher for the artificial compared to the natural redds; and a greater proportion of alevins migrated into the gravel during November in both the deeper natural and artificial (within criteria) redds compared to shallow artificial redds. Therefore, eggs incubating in shallower redds where alevin mobility is apparently lower may suffer greater mortality compared to deeper egg plants if freezing temperatures occur during hatching.

In general, however, the effects of freezing temperatures on egg survival in redds could not be determined during the study due to the very mild winter conditions experienced in both 1980/81 and 1982/83. Also, since no determination of natural redd egg-to-alevin survival was made, comparison of natural with egg plant box survival was not possible.

Table 22. Survival rates of planted chinook eggs, Nechako River, 1982.

| Redd No. | Redd type | Depth of gravel over box | Date box removed | No. eggs live | No. eggs dead | No. alevins in box | % Egg survival | No. alevins in gravel[a] | % Migrated alevins |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Artificial (shallow) | 15 cm | Oct. 19/82 | 43 | 2 | 0 | 96 | 0 | -[b] |
| | | " | Nov. 9/82 | 0 | 0 | 23 | 100 | 27 | 54 |
| | | " | " | 0 | 0 | 49 | 100 | 1 | 2 |
| | | " | Nov. 25/82 | 0 | 6 | 22 | 88 | 22 | 50 |
| | | (Small"Holes) | " | 0 | 0 | 52 | 100 | N/A | - |
| 2 | Artificial (shallow) | 25 cm | Oct. 19/82 | 48 | 1 | 0 | 98 | 0 | -[b] |
| | | (Vibert)" | Nov. 9/82 | 0 | 36 | 3 | 28 | 11 | 79 |
| | | (Vibert)" | " | 0 | 20 | 22 | 60 | 8 | 27 |
| | | " | " | 0 | 1 | 52 | 98 | 0 | 0 |
| | | " | Nov. 25/82 | 0 | 3 | 2 | 94 | 45 | 96 |
| | | " | " | 0 | 0 | 34 | 100 | 26 | 52 |
| 3 | Artificial (within criteria) | 15 cm | Oct. 19/82 | 40 | 7 | 0 | 85 | 0 | -[b] |
| | | " | Nov. 9/82 | 0 | 12 | 2 | 76 | 36 | 95 |
| | | (Small"Holes) | " | 0 | 7 | 44 | 86 | N/A | - |
| | | " | Nov. 25/82 | 0 | 3 | 0 | 94 | 47 | 100 |
| | | " | " | 0 | 16 | 8 | 68 | 26 | 76 |
| 4 | Artificial (within criteria | 25 cm | Oct. 19/82 | 46 | 8 | 0 | 85 | 0 | -[b] |
| | | " | Nov. 9/82 | 0 | 32 | 22 | 41 | 0 | 0 |
| | | " | " | 0 | 4 | 0 | 92 | 46 | 100 |
| | | " | " | 0 | 9 | 0 | 82 | 41 | 100 |
| | | " | Nov. 25/82 | 0 | 5 | 0 | 90 | 45 | 100 |
| | | " | " | 0 | 18 | 0 | 64 | 32 | 100 |
| 5 | Natural (within criteria) | 15 cm | Oct. 14/82 | 28 | 25 | 0 | 53 | 0 | -[b] |
| | | " | Nov. 9/82 | 0 | 3 | 2 | 94 | 45 | 96 |
| | | " | " | 0 | 13 | 15 | 74 | 22 | 59 |
| | | " | Nov. 25/82 | 0 | 15 | 0 | 70 | 35 | 100 |
| | | " | " | | 17 | 5 | 65 | 28 | 85 |
| 6 | Natural (within criteria) | 25 cm | Oct. 19/82 | 37 | 13 | 0 | 74 | 0 | -[b] |
| | | " | Nov. 9/82 | 0 | 7 | 31 | 86 | 12 | 28 |
| | | 25 cm | Nov. 25/82 | 0 | 25 | 0 | 50 | 25 | 100 |
| | | " | " | 0 | 20 | 2 | 60 | 28 | 93 |

[a] Estimated number of alevins in gravel = 50 (i.e. approx. initial No. of eggs planted) - (No. live eggs + No. dead eggs + No. alevins in box).

[b] Pre-hatching period.

## Temperature measurements

In 1980/81, mean river temperatures at the incubation site near Irvine's Lodge (Fig. 2) declined from around 14°C in early September to around 1°C to 2°C during December 1980 to February 1981 (Appendix 34). The Nechako River did not freeze during the winter of 1980/81.

The 1982/83 mean daily water temperatures, their ranges and accumulated heat units (°C - days) for the two redds monitored at different gravel depths and the ambient air temperatures are given in Appendix 35. Mean air temperatures dropped below -20°C by late November and generally remained below -10°C throughout December and January. Mean water temperatures in the unexposed artificial redd at all three gravel depths sampled (10 cm, 30 cm, 40 cm) declined from around 14°C in September to around 1°C in January and February 1983 and remained above freezing throughout the period of record. The Nechako River did not freeze during the winter of 1982/83.

By comparison, water temperatures in 1982 in the exposed redd at the 10 cm gravel depth dropped to just below freezing during late November, early January and February. The egg plant in the exposed redd was not examined until February 23. Of the 50 eggs originally placed in the box, 17 were found dead and no alevins were observed. Since hatching that year was estimated to be the first week of November and the box did not freeze until late November, the alevins probably manoeuvered to safety before frost set in.

## Gravel sampling in redds

The 1980 results of spawning gravel particle size analysis are shown in Appendix 36. On the average, 95% of each sample consisted of coarse particles(> 0.5 mm) and no significant difference was observed between gravel composition of man-made (artificial) and natural redds.

The 1982 results of gravel particle size analysis are shown in Appendix 37. There was no significant difference between the gravel composition of the artificial redd sampled in 1982 and the values obtained for the natural redds sampled in 1980 (Appendix 36).

# SUMMARY


## Capture of chinook juveniles 1980

During May and June, largest numbers of chinook fry were captured using beach seines in nearshore margins of Nechako mainstem adjacent to major spawning areas above Greer Creek. From July to November, beach seine catches at all sites sampled were relatively low. July catches in the mainstem using fyke net and inclined plane trap were also low.

Emergent fry utilized shallow (0.3 m), low velocity (0.3 m/sec flow) river margins close to spawning areas, but in June moved into deeper, faster flowing water.

Considerable juvenile migration occurred out of Greer Creek throughout the fall; few fry migrated in or out of Cutoff Creek in September and early November.

The estimated number of juveniles rearing in the tributaries was small (< 7%) compared to the total emergent river population.

Capture of chinook juveniles 1981

Downstream migration in the upper Nechako mainstem above Cutoff Creek peaked in the third week of April, declined in May, and was minor through September. Downstream migration at Diamond Island peaked in the third week of June and declined in July. Downstream migration at Prince George peaked in the first week of July.

Chinook fry marked and released in the Nechako mainstem in April and May were recaptured between late May and October in the Nechako mainstem and its tributaries. Recapture studies showed downstream fry migration past Diamond Island and Prince George, fry dispersal in the mainstem and tributaries, and some upstream fry movement.

Growth of chinook juveniles 1980, 1981

Growth rates and condition factors of chinook juveniles rearing in the Nechako mainstem were generally similar for 1980 and 1981.

Chinook fry in the tributaries had an apparently slower growth rate compared to fry in the mainstem.

Juvenile chinook stomach contents 1980

In general, Diptera (Chironomidae in particular) and Ephemeroptera were the dominant prey of both the mainstem and tributary rearing fish throughout the summer. Insects of terrestrial origin and amphipods were also important to chinook juveniles in several tributary streams. Site specific diets were related to prey availability and indicated that chinook juveniles are opportunistic feeders.

Juvenile chinook stomach contents 1981

Diptera were the dominant prey of the mainstem rearing chinook throughout spring and summer but especially in April. Diet diversity increased in the summer.

Benthic and drift sampling 1980

The Nechako mainstem and tributaries had similar dominant benthic taxa but tributaries had a greater benthic diversity.

Diptera were the dominant invertebrates in both the benthic and drift samples but copepods, recruited from upstream lakes, were also very abundant occasionally in the mainstem.

Benthic and drift sampling 1981

As in 1980, Diptera were the dominant invertebrates in both the benthic and drift samples in the mainstem and represented a major food source of the rearing chinook juveniles in the Nechako system.

The lowest benthic biomass appeared to occur in mid-summer during the period of greatest drift intensity, and was probably related to emergence of insects.

Benthic biomass in different habitats was very low and rarely exceeded 0.5 $g/m^2$. All habitats sampled generally showed comparable production of benthic macrofauna and benthic biomass was distributed roughly evenly across the upper river site. Consequently, all depths may contribute significantly to benthic production and any dewatering of the shallow areas may reduce food producion for fish.

Rearing habitat assessment 1982

Using depth and velocity criteria for rearing, rearing habitat generally increased with decreasing discharge. Significant reduction in wetted river width and therefore in nearshore rearing habitat occurred in single channels when discharges decreased from 56.6 $m^3$/sec (2000 cfs) to 14.2 $m^3$/sec (500 cfs).

Total length of wetted side channels generally increased when discharges increased from 11.6 $m^3$/sec (410 cfs) to 56.6 $m^3$/sec (2000 cfs).

Adult chinook sampling 1980, 1981, 1982

Estimated chinook escapements to the Nechako River between Cheslatta Falls and Vanderhoof in 1980, 1981 and 1982 were 2023, 500 (probably underestimated) and 1300 fish respectively. Spawning activity peaked around mid-September.

Spawner densities in 1980 were highest above the Cutoff Creek confluence and lowest below the Nautley River confluence.

Overall mean postorbital-hypural length for 1980, 1981 and 1982 was 73.0 cm for males and 70.0 for females. Spawner weight in 1980 averaged 8.1 kg for males and 6.2 kg for females.

Mean fecundity was estimated at 5000 eggs per female. Mean egg retention was negligible.

Adults aged 4 and 5 years constituted 98.4% of spawners sampled in 1980, 96.8% in 1981 and 98.9% in 1982. Adults with one full year in freshwater constituted 87.8% of spawners sampled in 1980, 95.0% in 1981 and 100% in 1982.

Incubation studies 1980, 1982

The percentage of surveyed redds that remained covered to a given water depth declined rapidly as discharge declined from 33.7 $m^3$/sec (1190 cfs) to 9.9 $m^3$/sec (350 cfs).

The 1980 egg plants were eyed by October 10 (280$^0$C - days), started to hatch by November 5 ( 511°C - days) and completed hatching by November 18 (594$^0$C - days).

Effect of freezing temperatures on egg-to-alevin survival for different gravel planting depths could not be well documented due to the mild winter conditions during 1980/81 and 1982/83.

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Appendix 1. Location and fishing period of chinook juvenile traps, Nechako River, March - September 1981 (IPT - inclined plane trap; FN - fyke net).

| TRAP No. | Type | Location (Fig. 4) | Fishing period |
|---|---|---|---|
| 7[a] | 2x3 IPT | - just upstream of Cutoff Cr. | March 18-May 16 |
| 8[a] | 2x3 IPT | - just upstream of Cutoff Cr. | |
| 1 | 2x3 IPT | 2 km upstream of Twin Cr. | April 16-May 8 and May 26-31 |
| 2 | 2x3 IPT | 1 km downstream of Twin Cr. | |
| 3 | FN | 2 km downstream of Twin Cr. | |
| 4 | FN | 2 km downstream of Twin Cr. | |
| 5 | FN | 3 km downstream of Twin Cr. | |
| 1 | 2x3 IPT | - as above | June 2-10 |
| 2 | 2x3 IPT | - as above | |
| 5 | FN | - as above | |
| 9 | FN | - near downstream branch of Cutoff Cr. | |
| 2 | 2x3 IPT | - as above | Aug. 31-Sept. 11 |
| 8 | 2x3 IPT | - as above | |
| 4 | FN | - as above | Sept. 7-11 |
| 5 | FN | - as above | |
| 9 | FN | - as above | |
| 5 | FN | - as above | Sept. 23-30 |
| 9 | FN | - as above | |
| 6 | FN | - just downstream of FN No. 5 | - fished 1 day only in September; no catch. |
| Fence trap[a] | | - near Diamond Island. | May 18-July 16 |
| One 4x4[a] | | - at Prince George | June 13-Aug. 24 |
| One 2x3[a] | | - at Prince George | |

[a] Operated by Envirocon Ltd.

## Appendix 2. Evaluation of the relative sampling efficiencies of the Mundie and Galen samplers, 1981.

The Galen and Mundie samplers were compared to assess the relative effectiveness of sampling in shallow and deep water during the 1981 Nechako benthic production studies. Results of comparison of these two samplers were applicable to overall benthic work.

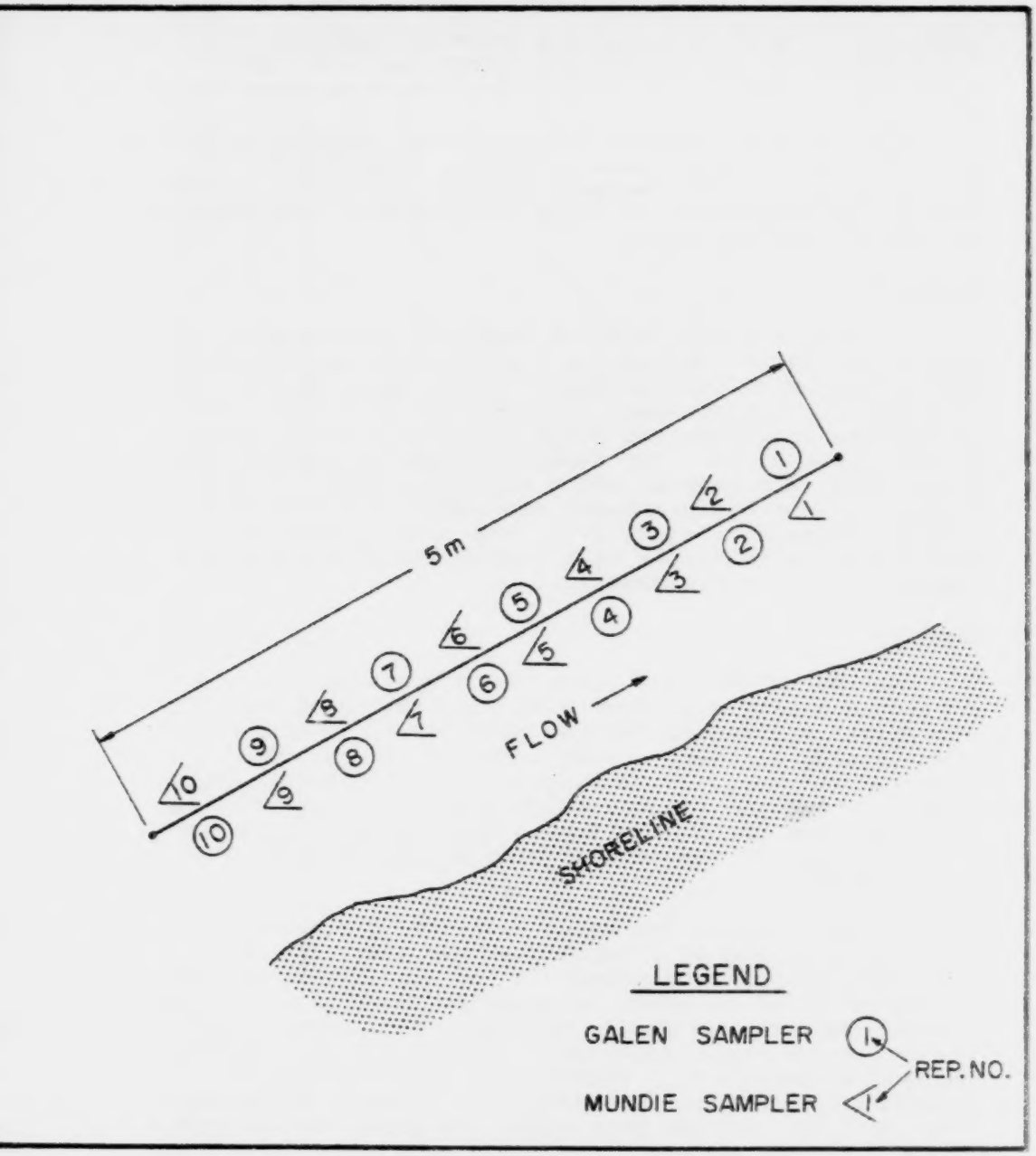
### Methods

To evaluate the relative sampling efficiencies of the Mundie and Galen samplers, a 5 m transect was established during September 1981 adjacent to the upper benthic sampling site No. 3. The transect extended across a fast flowing run of uniform substrate and velocity, with a water depth greater than 30 cm. Ten replicate benthic samples were taken with each sampler along alternate sides of the transect. A diagram showing the sampling arrangement is given in Appendix Figure 2-1. The total number of macrofauna collected in each sample was determined and compared for the two samplers.

### Results

Appendix Table 2-1 lists the macrofauna counts by replicate and by gear type with the results of statistical treatments applied to the two gear types. Macrofauna abundance data showed a wide range of values; 190 organisms/$m^2$ to 1,118 organisms/$m^2$ for the Mundie gear and 169/$m^2$ to 1436/$m^2$ for the Galen sampler. Means and variances for the 10 replicates for each gear type were T-tested against one another with no significant differences.

In addition to the above statistical treatments, macrofauna counts of 5 replicates per gear type were T-tested against each other with no significant differences at the 5% level as shown in Appendix Table 2-2. Biomass values based on macrofauna were also "T" tested (Mundie against Galen replicates) with no significant differences (Appendix Table 2-3). Correlation coefficients for macrofauna counts and standing crop biomass values by replicate for the two gear types are presented in Appendix Table 2-4. A combined correlation value of 0.96 for both gear types indicated good correspondence between macrofauna abundance and biomass for both samplers and between samplers.




Appendix Figure 2-1. Comparison of Galen and Mundie samplers, Nechako River, 1981.

Appendix Table 2-1. Results of macrofauna analysis (No. organisms/$m^2$) in Mundie/Galen gear comparison, 1981.

MUNDIE (Sampled area 0.228 $m^2$)

| Replicate | No. observations | No. organisms |
|---|---|---|
| 1 | 35 | 801 |
| 2 | 34 | 896 |
| 3 | 45 | 924 |
| 4 | 28 | 236 |
| 5 | 42 | 576 |
| 6 | 29 | 236 |
| 7 | 22 | 190 |
| 8 | 37 | 373 |
| 9 | 37 | 1,118 |
| 10 | 27 | 244 |
| Total | 336 | 5,594 |
| Mean No. org. | 559.4 | |
| 1 S.D. | 349.1 | |
| Variance (n-1) | $109.7 \times 10^3$ | |

GALEN (Sampled area 0.164 $m^2$)

| Replicate | No. observations | No. organisms |
|---|---|---|
| 1 | 30 | 502 |
| 2 | 22 | 252 |
| 3 | 32 | 447 |
| 4 | 23 | 313 |
| 5 | 47 | 1,383 |
| 6 | 16 | 169 |
| 7 | 37 | 690 |
| 8 | 36 | 642 |
| 9 | 61 | 1,437 |
| 10 | 34 | 599 |
| Total | 338 | 6,434 |
| Mean No. org. | 643.4 | |
| 1 S.D. | 438.04 | |
| Variance (n-1) | $172.7 \times 10^3$ | |

T-Test of difference between the 2 variances - not significant.
T-Test of the 2 means from different populations - not significant.

Appendix Table 2-2. T-Tests of odd numbered vs. even numbered replicates and replicates 1 to 5 vs. 1 to 10 taken with Mundie and Galen samplers, 1981.

1) Odd reps. vs. even reps. for Galen and Mundie macrofauna (No. organisms/$m^2$)

| MUNDIE | | GALEN | |
|---|---|---|---|
| Odd reps. | Even reps. | Odd reps. | Even reps. |
| 801 | 396 | 502 | 252 |
| 924 | 236 | 447 | 313 |
| 596 | 236 | 1383 | 169 |
| 190 | 373 | 690 | 642 |
| 1118 | 244 | 1437 | 599 |
| Mean 721.8 | 297.0 | 891.8 | 395.0 |
| 1 S.D. 356.4 | 80.4 | 481.9 | 212.6 |
| Sample variance 127050.2 | 6457.0 | 232258.7 | 45218.5 |
| Variance test (F=9.6) | 19.7 sign.at 5% | 5.1 ns at 5% | |
| T-test ($t_{0.05}$=2.78) | 2.6 ns at 5% | 2.11 ns at 5% | |

2) Reps. 1-5 vs. 6-7 (No. organisms/$m^2$)

| MUNDIE | | GALEN | |
|---|---|---|---|
| Reps. 1-5 | Reps. 6-10 | Reps. 1-5 | Reps. 6-10 |
| 801 | 236 | 502 | 169 |
| 396 | 190 | 252 | 690 |
| 924 | 373 | 447 | 642 |
| 236 | 1118 | 313 | 1437 |
| 576 | 244 | 1383 | 599 |
| Mean 586.6 | 432.2 | 579.4 | 707.4 |
| 1 S.D. 282.4 | 389.4 | 460.3 | 457.9 |
| Sample variance 79791.8 | 151600.2 | 211863.3 | 209630.3 |
| Variance test (F=9.6) | 1.9 ns at 5% | 1.0 ns at 5% | |
| T-test ($t_{0.05}$=2.78) | 0.72 ns at 5% | 0.44 ns at 5% | |

Appendix Table 2-3. T-test of biomass values for Mundie vs. Galen replicate samples, Nechako River, 1981.

| Vol. ($ml/m^2$) | Rep. | Mundie | Galen | Wet Wt. ($g/m^2$) | Rep. | Mundie | Galen |
|---|---|---|---|---|---|---|---|
| | 1 | 3.5 | 0.6 | | 1 | 3.682 | 0.793 |
| | 2 | 3.9 | 1.8 | | 2 | 3.800 | 1.622 |
| | 3 | 3.5 | 0.6 | | 3 | 3.760 | 0.726 |
| | 4 | 0.9 | 0.6 | | 4 | 0.736 | 0.598 |
| | 5 | 3.1 | 3.7 | | 5 | 2.824 | 3.250 |
| | 6 | 0.4 | 1.2 | | 6 | 0.398 | 1.134 |
| | 7 | 0.4 | 1.8 | | 7 | 1.280 | 2.090 |
| | 8 | 2.6 | 2.4 | | 8 | 2.230 | 2.450 |
| | 9 | 4.4 | 3.0 | | 9 | 4.520 | 2.840 |
| | 10 | 0.9 | 1.2 | | 10 | 0.836 | 1.310 |
| Mean | | 2.36 | 1.69 | | | 2.31 | 1.68 |
| 1 S.D. | | 1.55 | 1.07 | | | 1.63 | 0.94 |
| Sample variance | | 2.41 | 1.15 | | | 2.64 | 0.88 |
| Variance test ($F_{0.05}$=4.03) | | 2.1 ns at 5% | | | | 3.0 ns at 5% | |
| T-test ($t_{0.05}$=2.262) | | 1.12 ns at 5% | | | | 1.06 ns at 5% | |

| Dry Wt. ($g/m^2$) | Rep. | Mundie | Galen | Abundance (No. $/m^2$) | Rep. | Mundie | Galen |
|---|---|---|---|---|---|---|---|
| | 1 | 0.587 | 0.140 | | 1 | 801 | 502 |
| | 2 | 0.473 | 0.220 | | 2 | 396 | 252 |
| | 3 | 0.480 | 0.110 | | 3 | 924 | 447 |
| | 4 | 0.096 | 0.090 | | 4 | 236 | 313 |
| | 5 | 0.359 | 0.500 | | 5 | 576 | 1383 |
| | 6 | 0.061 | 0.201 | | 6 | 236 | 169 |
| | 7 | 0.035 | 0.354 | | 7 | 190 | 690 |
| | 8 | 0.398 | 0.348 | | 8 | 373 | 642 |
| | 9 | 0.744 | 0.445 | | 9 | 1118 | 1437 |
| | 10 | 0.105 | 1.232 | | 10 | 244 | 599 |
| Mean | | 0.334 | 0.264 | | | 509.4 | 643.4 |
| 1 S.D. | | 0.247 | 0.141 | | | 330.9 | 438.0 |
| Sample variance | | 0.061 | 0.020 | | | 109462.9 | 191881.6 |
| Variance test ($F_{0.05}$=4.03) | | 3.05 ns at 5% | | | | 1.75 ns at 5% | |
| T-test ($t_{0.05}$=2.26) | | 0.78 ns at 5% | | | | 0.77 ns at 5% | |

Appendix Table 2-4. Comparison of two correlation coefficients (No. macrofauna/$m^2$ and dry weight/$m^2$) in Mundie/Galen gear comparison, 1981.

| MUNDIE | | | GALEN | | |
|---|---|---|---|---|---|
| Rep. | No./$m^2$ | Dry Wt. g /$m^2$ | Rep. | No./$m^2$ | Dry Wt. g /$m^2$ |
| 1 | 801 | 0.587 | 1 | 502 | 0.140 |
| 2 | 396 | 0.473 | 2 | 252 | 0.221 |
| 3 | 924 | 0.480 | 3 | 447 | 0.110 |
| 4 | 236 | 0.096 | 4 | 313 | 0.090 |
| 5 | 576 | 0.359 | 5 | 1383 | 0.500 |
| 6 | 236 | 0.061 | 6 | 169 | 0.201 |
| 7 | 190 | 0.035 | 7 | 690 | 0.354 |
| 8 | 373 | 0.398 | 8 | 642 | 0.348 |
| 9 | 1118 | 0.744 | 9 | 1437 | 0.445 |
| 10 | 244 | 0.105 | 10 | 599 | 0.232 |
| r | | 0.9656 | r | | 0.9588 |
| Transformed r | | 2.0233 | Transformed r | | 1.9308 |
| num. | | 10 | num. | | 10 |

$z = 0.17305$

$z_{0 \cdot 05(2)} = 1.96$

Do not reject null hypothesis - i.e. $p_1 - p_2$

The common correlation coefficient would be

$$z_{common} = \frac{7 \times 2.0233 + 7 \times 1.9308}{7 + 7} = 1.97705$$

$r_{common} = 0.9624$

Microfauna abundance was several orders of magnitude greater than macrofauna abundance. Appendix Table 2-5 lists the combined macrofauna and microfauna results expressed as numbers/$m^2$ by replicate and gear type.

Statistical treatment of total abundance data involved dividing the replicate samples from each gear type into odd numbered and even numbered replicates. Odd numbered replicates were T-tested against even numbered replicates of the same gear type. Replicates 1 through 5 and 6 through 10 of each gear type were also T-tested in various combinations. Finally, Mundie replicates were T-tested against Galen replicates.

Odd Mundie replicates T-tested against even Mundie replicates showed no significant difference. However, odd Galen replicates tested against even Galen replicates showed a significant difference between groups. T-testing of 10 Mundie replicates against 10 Galen replicates showed a significant difference for untransformed (No. organisms $m^2$) values but no significant difference when using LN transformed (No. $m^2$) values. The significance of these results are examined in the discussion section below.

Appendix Table 2-6 lists the pooled totals and percentage composition for 10 replicates for each taxon by gear type. Differences in total numbers and the percentage composition data for Baetidae, Ephemerellidae, Hydropsychidae, Hydroptilidae, Chironomidae and Tipulidae indicated that further T-testing by replicate, gear type and taxon was desirable. Results of this further testing are presented in Appendix Table 2-7 and show significant differences between gear types for Baetidae and Tipulidae.

Spatial relationships of taxa selected for T-testing (Ephemerellidae, Hydropsychidae, Hydroptilidae, Chironomidae, Tipulidae and Baetidae) were determined using the Chi-squared method for agreement with a Poisson series. Results of Chi-squared tests are presented in Appendix Table 2-8. Since variances were significantly greater than the means for all fauna tested, a clumped distribution best described their aggregations.

Appendix Table 2-5. Combined microfauna and macrofauna abundance (No./$m^2$) using Mundie and Galen samplers, Nechako River, 1981.

i) all 10 reps. $t_{0.05}{}^{9} = 2.262$

| Rep. | MUNDIE | GALEN |
|---|---|---|
| 1 | 21,255 | 6,153 |
| 2 | 38,218 | 39,271 |
| 3 | 46,873 | 5,008 |
| 4 | 36,670 | 5,824 |
| 5 | 33,636 | 14,754 |
| 6 | 20,969 | 17,675 |
| 7 | 16,299 | 13,377 |
| 8 | 37,916 | 64,243 |
| 9 | 26,054 | 22,117 |
| 10 | 28,261 | 5,916 |
| Mean | 30,614.1 | 19,433.8 |
| 1 S.D. | 9,620.86 | 18,922.9 |
| 95% confidence limits: | | |
| upper | 37,496.0 | 32,969.5 |
| lower | 23,732.2 | 5,898.1 |

ii) 3 randomly chosen reps. $t_{0.05}(2) = 4.303$

| Rep. | MUNDIE | GALEN |
|---|---|---|
| 5 | 33,636 | 14,754 |
| 8 | 37,916 | 64,243 |
| 10 | 28,261 | 5,916 |
| Mean | 33,271.0 | 28,304.3 |
| 1 S.D. | 4,837.8 | 31,435.9 |
| 95% confidence limits: | | |
| upper | 45,289.8 | 106,401.8 |
| lower | 21,252.2 | -49,793.2 |

Appendix Table 2-6. Total number of organisms/$m^2$ and % composition of organisms for 10 replicate benthic samples by gear type, Nechako River, 1981.

| TAXON | MUNDIE | GALEN | MUNDIE | GALEN |
|---|---|---|---|---|
| | No./$m^2$ | | % Composition | |
| Insecta | | | | |
| Collembola | | | | |
| Unknown | 140 | 0 | 0.0 | 0.0 |
| Ephemeroptera | | | | |
| Baetidae | 9822 | 1463 | 3.2 | 0.7 |
| Ephemerellidae | 20595 | 13247 | 6.7 | 6.8 |
| Heptageniidae | 13015 | 9995 | 4.2 | 5.1 |
| Siplonuridae | 140 | 0 | 0.0 | 0.0 |
| Unknown | 1541 | 0 | 0.5 | 0.0 |
| Odonata | | | | |
| Gomphidae | 28 | 18 | 0.0 | 0.0 |
| Plecoptera | | | | |
| Perlodidae | 3207 | 3473 | 1.0 | 1.7 |
| Perlidae | 37 | 396 | 0.0 | 0.2 |
| Chloroperlidae | 6328 | 4598 | 2.0 | 2.3 |
| Unknown | 984 | 0 | 0.3 | 0.0 |
| Trichoptera | | | | |
| Glossosomatidae | 1465 | 1429 | 0.4 | 0.7 |
| Hydropsychidae | 40920 | 37097 | 13.3 | 19.5 |
| Hydroptilidae | 60414 | 34286 | 19.7 | 17.6 |
| Lepidostomatidae | 988 | 93 | 0.3 | 0.0 |
| Leptoceridae | 1272 | 957 | 0.4 | 0.4 |
| Psychomyiidae | 4 | 6 | 0.0 | 0.0 |
| Polycentropodidae | 18 | 299 | 0.0 | 0.1 |
| Rhyacophilidae | 0 | 396 | 0.0 | 0.2 |
| Unknown | 704 | 0 | 0.2 | 0.0 |
| Diptera | | | | |
| Chironomidae | 97871 | 52283 | 31.9 | 26.9 |
| Ceratopogonidae | 0 | 49 | 0.0 | 0.0 |
| Empididae | 1826 | 504 | 0.6 | 0.2 |
| Thaumaleidae | 0 | 2000 | 0.0 | 1.0 |
| Tipulidae | 4026 | 788 | 1.3 | 0.4 |
| Unknown | 0 | 396 | 0.0 | 0.2 |
| Arachnida | | | | |
| Acari | | | | |
| Unknown | 17514 | 12381 | 5.7 | 6.3 |

Appendix Table 2-6. (Cont'd.)

| TAXON | MUNDIE No./$m^2$ | GALEN No./$m^2$ | MUNDIE % Composition | GALEN % Composition |
|---|---|---|---|---|
| Crustacea | | | | |
| Copepoda | | | | |
| Calanoida | 564 | 423 | 0.1 | 0.2 |
| Gastropoda | | | | |
| Megagastropoda | | | | |
| Unknown | 0 | 390 | 0.0 | 0.2 |
| Basommatophora | | | | |
| Lymnaeidae | 280 | 6 | 0.0 | 0.0 |
| Pelecypoda | | | | |
| Eulamellibranchia | | | | |
| Unknown | 20273 | 15224 | 6.6 | 7.8 |
| Oligochaeta | | | | |
| Unknown | 860 | 843 | 0.2 | 0.4 |
| Hirudinea | | | | |
| Unknown | 4 | 0 | 0.0 | 0.0 |
| Nematoda | | | | |
| Unknown | 1301 | 488 | 0.4 | 0.2 |

Appendix Table 2-7. Taxa selected from Appendix Table 2-7 for T-testing in Mundie/Galen gear comparison, 1981.

| Taxa | | Mundie | Galen |
|---|---|---|---|
| Ephemerellidae | Mean 10 Reps. $\bar{x}$ | 2059.5 | 1324.7 |
| | 1 S.D. | 1246.6 | 1329.7 |
| | Total | 20595. | 13247. |
| | T-Test 0.735 not significant - Variance ns | | |
| Hydropsychidae | Mean 10 Reps. $\bar{x}$ | 4092.0 | 3790.7 |
| | 1 S.D. | 2216.7 | 4178.3 |
| | Total | 40920. | 37907. |
| | T-Test 0.126 not significant - Variance ns | | |
| Hydroptilidae | Mean 10 Reps | 6041.4 | 3428.6 |
| | 1 S.D. | 2174.4 | 3191.2 |
| | Total | 60414. | 34286. |
| | T-Test 0.998 not significant - Variance ns | | |
| Chironomidae | Mean 10 Reps | 9787.1 | 5228.3 |
| | 1 S.D. | 3838.8 | 4824.3 |
| | Total | 97871. | 52283. |
| | T-Test 1.09 not significant - Variance ns | | |

Tipulidae

| Rep. | Mundie | Galen | Rep. | Mundie | Galen |
|---|---|---|---|---|---|
| 1 | 162 | 6 | 1 | 841 | 390 |
| 2 | 1,124 | 0 | 2 | 2,801 | 0 |
| 3 | 292 | 78 | 3 | 841 | 169 |
| 4 | 1,124 | 12 | 4 | 1,965 | 49 |
| 5 | 380 | 194 | 5 | 1,405 | 506 |
| 6 | 156 | 195 | 6 | 1,829 | 98 |
| 7 | 298 | 207 | 7 | 140 | 202 |
| 8 | 17 | 12 | 8 | 0 | 0 |
| 9 | 578 | 5.4 | 9 | 0 | 0 |
| 10 | 4 | 30 | 10 | 0 | 49 |
| Mean | 402.6 | 78.8 | Mean | 982.2 | 146.3 |
| 1 S.D. | 413.3 | 86.0 | SD | 989.6 | 175.7 |
| Total | 4,026 | 788 | Total | 9,822 | 1,463 |
| T-Test | 2.42 Sig. | Var.Sig. | T-Test | 2.63 Sig. | Var.Sig. |

Appendix Table 2-8. $X^2$ Test (variance to mean ratio) for agreement with a Poisson series for small samples (n < 31), Mundie/Galen gear comparison, 1981 (Elliott 1971).

A. TC Hydropsychidae

| Rep | Mundie | Galen | Total |
|---|---|---|---|
| 1 | 3,703 | 980 | 4,683 |
| 2 | 5,944 | 7,454 | 13,398 |
| 3 | 5,116 | 602 | 5,718 |
| 4 | 5,953 | 991 | 6,944 |
| 5 | 8,469 | 3,457 | 11,926 |
| 6 | 2,131 | 5,629 | 7,760 |
| 7 | 1,824 | 1,884 | 3,708 |
| 8 | 2,861 | 13,777 | 16,638 |
| 9 | 3,214 | 2,292 | 5,506 |
| 10 | 1,705 | 841 | 2,546 |
| Mean | 4,092.0 | 3,790.7 | 7,882.7 |
| 1 S.D. | 2,216.7 | 4,178.3 | 4,604.3 |
| $X^2$ | 10,808 [a] | 41,450 [a] | 24,205 [a] |
| Distribution | Clumped | Clumped | Clumped |

B. TC Hydroptilidae

| Rep. | Mundie | Galen | Total |
|---|---|---|---|
| 1 | 4,917 | 638 | 5,555 |
| 2 | 6,475 | 6,676 | 13,151 |
| 3 | 6,571 | 994 | 7,565 |

Appendix Table 2-8 (Cont'd.)

| Rep. | Mundie | Galen | Total |
|---|---|---|---|
| 4 | 6,165 | 701 | 6,866 |
| 5 | 3,752 | 2,231 | 5,983 |
| 6 | 4,094 | 2,647 | 6,741 |
| 7 | 3,113 | 3,127 | 6,240 |
| 8 | 10,420 | 10,590 | 21,010 |
| 9 | 7,583 | 5,146 | 12,729 |
| 10 | 7,324 | 1,536 | 8,860 |
| Mean | 6,041.4 | 3,428.6 | 9,470.0 |
| 1 S.D. | 2,174.4 | 3,191.2 | 4,870.4 |
| $X^2$ | 7,043.2 [a] | 26,732 [a] | 22,544 [a] |
| Distribution | Clumped | Clumped | Clumped |

C. DP Chironomidae

| Rep | Mundie | Galen | Total |
|---|---|---|---|
| 1 | 5,044 | 1,789 | 6,833 |
| 2 | 12,241 | 14,523 | 26,764 |
| 3 | 16,773 | 1,616 | 18,389 |
| 4 | 10,749 | 2,121 | 12,870 |
| 5 | 8,961 | 4,238 | 13,199 |
| 6 | 5,556 | 4,554 | 10,110 |
| 7 | 5,555 | 3,072 | 8,627 |
| 8 | 13,897 | 13,553 | 27,450 |
| 9 | 8,898 | 5,216 | 14,114 |
| 10 | 10,197 | 1,601 | 11,798 |
| Mean | 9,787.1 | 5,228.3 | 15,015.4 |
| 1 S.D. | 3,838.3 | 4,824.3 | 7,109.6 |
| $X^2$ | 13,548 [a] | 40,064 [a] | 30,297 [a] |
| Distribution | Clumped | Clumped | Clumped |

Appendix Table 2-8 (Cont'd.)

D. DP Tipulidae

| Rep. | Mundie | Galen | Total |
|---|---|---|---|
| 1 | 162 | 6 | 168 |
| 2 | 1,124 | 0 | 1,124 |
| 3 | 292 | 78 | 370 |
| 4 | 1,124 | 12 | 1,136 |
| 5 | 280 | 194 | 474 |
| 6 | 156 | 195 | 351 |
| 7 | 289 | 207 | 496 |
| 8 | 17 | 12 | 29 |
| 9 | 578 | 54 | 632 |
| 10 | 4 | 30 | 34 |
| Mean | 402.6 | 78.8 | 481.4 |
| 1 S.D. | 413.4 | 86.0 | 394.0 |
| $X^2$ | 3,820 [a] | 846 [a] | 2,902 [a] |
| Distribution | Clumped | Clumped | Clumped |

E. EM Ephemerellidae

| Rep | Mundie | Galen | Total |
|---|---|---|---|
| 1 | 26 | 1,025 | 1,051 |
| 2 | 2,525 | 1,560 | 4,085 |
| 3 | 3,100 | 427 | 3,527 |
| 4 | 1,965 | 322 | 2,287 |
| 5 | 4,793 | 1,737 | 6,530 |
| 6 | 1,703 | 1,178 | 2,881 |

Appendix Table 2-8 (Cont'd.)

| Rep. | Mundie | Galen | Total |
|---|---|---|---|
| 7 | 1,550 | 244 | 1,794 |
| 8 | 1,401 | 4,682 | 6,083 |
| 9 | 1,567 | 1,798 | 3,365 |
| 10 | 1,965 | 274 | 2,239 |
| Mean | 2,059.5 | 1,324.7 | 3,384.2 |
| 1 S.D. | 1,246.6 | 1,329.8 | 1,777.4 |
| $x^2$ | 6,792 [a] | 12,014 [a] | 8,402 [a] |
| Distribution | Clumped | Clumped | Clumped |

F. EM Baetidae

| Rep. | Mundie | Galen | Total |
|---|---|---|---|
| 1 | 841 | 390 | 1,231 |
| 2 | 2,801 | 0 | 2,801 |
| 3 | 841 | 169 | 1,010 |
| 4 | 1,965 | 49 | 2,014 |
| 5 | 1,405 | 506 | 1,911 |
| 6 | 1,829 | 98 | 1,927 |
| 7 | 140 | 202 | 342 |
| 8 | 0 | 0 | 0 |
| 9 | 0 | 0 | 0 |
| 10 | 0 | 49 | 49 |
| Mean | 982.2 | 146.3 | 1,128.5 |
| 1 S.D. | 989.6 | 175.7 | 1,010.3 |
| $x^2$ | 8,973 [a] | 1,899 [a] | 8,141 [a] |
| Distribution | Clumped | Clumped | Clumped |

Appendix Table 2-8 (Cont'd.)

G. All Taxa

| Rep. | Mundie | Galen | Total |
|---|---|---|---|
| 1 | 21,255 | 6,153 | 27,408 |
| 2 | 38,218 | 39,271 | 77,489 |
| 3 | 46,873 | 5,008 | 51,881 |
| 4 | 36,660 | 5,824 | 42,484 |
| 5 | 33,636 | 14,754 | 48,390 |
| 6 | 20,969 | 17,675 | 38,644 |
| 7 | 16,299 | 13,377 | 29,676 |
| 8 | 37,916 | 64,243 | 102,159 |
| 9 | 26,054 | 22,117 | 48,171 |
| 10 | 28,261 | 5,916 | 24,177 |
| Mean | 30,614.1 | 19,433.8 | 50,047.9 |
| 1 S.D. | 9,620.9 | 18,922.9 | 23,201.9 |
| $X^2$ | 27,211 [a] | 165,830 [a] | 96,806 [a] |
| Distribution | Clumped | Clumped | Clumped |

[a] variance is significantly greater than the mean.

## Discussion

Statistical testing of the counts obtained using the Mundie and Galen samplers was best expressed by results obtained for the macrofauna. Combined macrofauna and microfauna counts for 10 replicates per gear type showed no significant differences, but individual comparisons of two taxa (Baetidae and Tipulidae) did show significant differences between gear types for 10 replicates.

Variation in abundance of the different taxa from replicate to replicate and gear type to gear type is due in part to the clumped distribution of the benthic fauna Appendix Table 2-8. The larger sample area of the Mundie sampler (71% larger) reduces the variance in faunal counts compared to the Galen sampler. Therefore, fewer replicates are required to give statistically reliable results when using the Mundie sampler.

Based on statistical analysis of combined counts for both gear types when 10 or fewer replicates are taken in similar substrates, the sampling efficiency of the Galen and Mundie samplers was the same. Abundance and biomass results obtained using the Mundie sampler in shallow nearshore habitats are therefore comparable to similar results obtained using the Galen sampler in deep mid-channel habitats.

## Summary

In general, the fauna sampled along the Galen-Mundie comparison transect exhibited a clumped distribution when tested with the Chi-squared method outlined by Elliott (1971). Greater variance in abundance of fauna was found using the Galen sampler for the same number of replicates. This reflects the smaller sampling area of this gear (0.164 $m^2$ compared to 0.228 $m^2$ for Mundie sampler). Extensive statistical comparisons of the abundance and biomass results obtained with the two samplers showed little significant difference for the 10 replicates. Confidence limits for faunal abundances were narrower with the Mundie gear. It was concluded therefore that the efficiencies of the shallow water and the deep water samplers are comparable for equal numbers of replicates allowing for the greater variability of the Galen results.

## Appendix 3. Effects of subsampling microfauna on abundance estimates, Nechako benthos, 1981.

Evaluation of the reliability of abundance estimates derived from subsamples of benthic replicates obtained using the Folsom splitter was discussed by McEwen et al. (1954) and Van Guelpen et al. (1982). These authors reported that use of the Folsom splitter does not result in sampling bias and has a low coefficient of variation (4.8%-18%) for invertebrates sampled in the wild. However, while McEwen et al. (1954) stated that the Folsom process is subject to splitting errors of a random nature only, Van Guelpen et al. (1982) maintained that the contribution of subsampling error to total variance should be determined when sample abundance estimates are made. Since the present study employed the methods outlined by McEwen et al. (1954), no statistical analysis of subsampled fractions was performed. Accordingly, abundance estimates for the microfaunal fraction of each benthic sample may vary randomly by as much as 18% (Van Guelpen et al. 1982). Macrofauna were not subsampled and therefore abundance estimates for these larger organisms are not subject to sampling variations.

Appendix 4. Modified Wentworth particle size scale used for benthic substrate analysis, 1982.

| Rating | | Size (mm) Range | Approx. Median |
|---|---|---|---|
| 8 Bedrock | Solid | | |
| 7 Boulder | Mammoth boulder | 4000 | - |
| | Very large boulder | 3500-4000 | 3750 |
| | | 3000-3500 | 3250 |
| | | 2500-3000 | 2750 |
| | | 2000-2500 | 2250 |
| | Large boulder | 1650-2000 | 1825 |
| | | 1330-1650 | 1490 |
| | | 1000-1330 | 1165 |
| | Medium boulder | 830-1000 | 915 |
| | | 665- 830 | 750 |
| | | 500- 665 | 580 |
| | Small boulder | 415- 500 | 540 |
| | | 335- 415 | 375 |
| | | 250- 335 | 290 |
| 6 Cobble | Large cobble | 190- 250 | 220 |
| | | 130- 190 | 160 |
| 5 Large Gravel | Small cobble | 100- 130 | 115 |
| | | 64- 100 | 85 |
| 4 Med. Gravel | Very coarse gravel | 50- 64 | 57 |
| | | 32- 50 | 40 |
| 3 Small Gravel | Coarse gravel | 16- 32 | 24 |
| | Medium gravel | 8- 16 | 12 |
| | Fine gravel | 4- 8 | 6 |
| | Pea gravel | 2- 4 | 3 |
| 2 Sand | Very coarse sand | 1- 2 | 1.5 |
| | Sand | 0.062- 1 | 0.5 |
| 1 Silt | Silt - clay | <.062 | - |

Appendix 5. Beach seining results, Nechako River, 1980.

A. Sampling date - May 1, 1980 (only 5 sites sampled; 15 m seine)

| Site | Time | No. chinook fry/set | Temp°C |
|---|---|---|---|
| 1 | 1600 | 100 | 8 |
| 2 | 1100 | 64 | 8 |
| 3 | 1120 | 66 | 7 |
| 3a | 1330 | 50 | 8.5 |
| 5a | 1600 | 3 | 8.5 |

B. Sampling date - June 24-28, 1980 (helicopter; 15 m seine)

| Site | Date | Time | No. chinook fry/set | Temp°C |
|---|---|---|---|---|
| 1 | 24 | 1145 | 0 | 15 |
| | 25 | 2100 | 105 | 16 |
| | 26 | 1900 | 31 | 16 |
| 2 | 24 | 1200 | 1 | 15 |
| | 26 | 1830 | 0 | 16 |
| 3 | 23 | 2000 | 22 | 15 |
| | 24 | 1100 | 0 | 15 |
| | 26 | 2000 | 28 | 16 |
| 3a | 27 | 2300 | 7 | 17 |
| | 28 | 1245 | 51 | 16 |
| 4 | 24 | 1230 | 0 | 16 |
| | 26 | 1900 | 0 | 16 |
| 5 | 25 | 1635 | 0 | 16 |
| | 26 | 2025 | 2 | 16 |
| 5a | 27 | 1400 | 4 | 17 |
| | 28 | 1225 | 2 | 16 |
| 6 | 25 | 1700 | 4 | 18 |
| | 26 | 2040 | 2 | 17 |
| 7 | 25 | 1730 | 0 | 19 |
| | 26 | 2100 | 3 | 17 |
| 8 | 25 | 1800 | 0 | 18 |
| | 26 | 2120 | 6 | 17 |
| 10 | 25 | 1830 | 0 | 18 |
| | 26 | 2150 | 4 | 17 |
| 11 | 26 | 0900 | 1 | 17 |
| | 28 | 2130 | 1 | 18 |
| [illegible] | 26 | 0930 | 0 | 17 |
| [illegible] | 26 | 1000 | 0 | 18 |
| 14 | 26 | 1015 | 1 | 18 |
| 15 | 26 | 1050 | 1 | 18 |
| 16 | 26 | 1115 | 2 | 18 |
| 17 | 26 | 1155 | 0 | 18 |
| 18 | 26 | 1230 | 5 | 18 |
| | 28 | 2055 | 4 | 17 |
| 19 | 26 | 1300 | 1 | 18 |
| 20 | 26 | 1300 | 1 | 18 |
| 20 | 26 | 1345 | 0 | 18 |
| 21 | 26 | 1400 | 0 | 18 |
| 22 | 28 | 1120 | 11 | 16 |
| 23 | 28 | 1045 | 5 | 17 |
| | 28 | 2000 | 2 | 17.5 |
| 24 | 28 | 1000 | 8 | 16 |
| | 28 | 1940 | 3 | 18 |

Appendix 5 (Cont'd.)

C. Sampling date - July 16-19, 1980 (helicopter; 15 m seine)

| Site | Date | Time | No. chinook fry/set | Temp°C |
|---|---|---|---|---|
| 1 | 16 | 2000 | 4 | 16.5 |
| 2 | 16 | 1930 | 0 | 16.5 |
| 3 | 16 | 1720 | 0 | 16 |
| 3a | 16 | 1800 | 2 | 16 |
| 4 | 16 | 1830 | 0 | 17 |
| 5 | 16 | 1900 | 1 | 16 |
| 5a | 18 | 2000 | 1 | 16 |
| 6 | 19 | 1020 | 0 | 17 |
| 7 | 19 | 1140 | 0 | 18 |
| 8 | 19 | 1200 | 1 | 17 |
| 10 | 19 | 1220 | 0 | 17 |
| 11 | 18 | 2030 | 1 | 16 |
| 13 | 18 | 1640 | 0 | 16.5 |
| 14 | 18 | 1820 | 0 | 16 |
| 15 | 18 | 1800 | 0 | 16.5 |
| 16 | 18 | 1730 | 0 | 16 |
| 18 | 18 | 1710 | 0 | 17 |
| 19 | 18 | 1655 | 0 | 17 |
| 20 | 18 | 1640 | 1 | 17 |
| 21 | 18 | 1620 | 0 | 17.5 |
| 22 | 18 | 1600 | 10 | 17 |
| 23 | 18 | 1540 | 4 | 17.5 |
| 24 | 18 | 1510 | 1 | 17 |

D. Sampling date - July 31-August 1, 1980 (helicopter; 15m seine)

| Site | Date | Time | No. chinook fry/set | Temp°C |
|---|---|---|---|---|
| 1 | 31 | 1915 | 0 | 17 |
| 2 | 31 | 1845 | 0 | 17 |
| 3 | 31 | 1815 | 1 | 17.5 |
| 3a | 31 | 1800 | 1 | 18 |
| 4 | 31 | 1730 | 1 | 18 |
| 5 | 31 | 1715 | 0 | 18 |
| 5a | 31 | 1700 | 1 | 18 |
| 6 | 31 | 1630 | 0 | 17.5 |
| 10 | 1 | 1730 | 0 | 18 |
| 11 | 1 | 1715 | 0 | 18 |
| 13 | 1 | 1650 | 5 | 18 |
| 16 | 1 | 1630 | 0 | 18 |
| 20 | 1 | 1610 | 1 | 18.5 |
| 22 | 1 | 1545 | 1 | 19 |

E. Sampling date - August 10-14, 1980 (riverboat, 25 m seine)

| Site | Date | Time | No. chinook fry/set | Temp°C |
|---|---|---|---|---|
| 2 | 10 | 1300 | 0 | 18.5 |
| 3 | 10 | 1320 | 2 | 18.5 |
| 3a | 10 | 1350 | 0 | 18.5 |
| 4 | 10 | 1430 | 0 | 18.5 |
| 5a | 10 | 1530 | 0 | 20 |
| 7 | 11 | 1340 | 0 | 17.5 |
| 8 | 11 | 1315 | 0 | 18 |
| 9 | 12 | 1300 | 0 | 18.5 |
| 10 | 12 | 1335 | 0 | 19 |
| 11 | 12 | 1400 | 0 | 19.5 |
| 12 | 12 | 1410 | 0 | 18.5 |
| 13 | 12 | 1430 | 0 | 19 |
| 20 | 13 | 1130 | 4 | 19.5 |
| 21 | 13 | 1045 | 0 | 19.5 |

F. Sampling date - November 25-27, 1980 (riverboat, 25 m seine)

| Site | Date | Time | No. chinook fry/set | Temp°C |
|---|---|---|---|---|
| 2 | 25 | 1445 | 0 | - |
| 3 | 25 | 1535 | 1 | - |
| 3a | 25 | 1115 | 0 | - |

Appendix 6. Pyke net trapping results, Nechako River, 1980.

| Date | Time | Temperature | Observations |
|---|---|---|---|
| July 14 | 1600 | 17°C | Net installed. |
| July 16 | 1830 | 18°C | 1 chinook fry (44mm), 18 dace; 6 whitefish, 1 lamprey. |
| July 17 | 1330 | 17°C | 3 chinook fry, sucker fry, 2 whitefish, 2 shiners. |
| July 18 | 1940 | 18°C | 2 chinook fry (53 mm, 57mm), 57 dace, 6 whitefish. |
| July 19 | 1020 | 17°C | 0 chinook fry, 15 dace, 1 whitefish, 20 sucker fry. |

Appendix 7. Inclined plane trapping results, Nechako River, 1980.

| Date | Time | Temperature | Observations |
|---|---|---|---|
| July 14 | - | - | Trap installed. |
| July 16 | 1740 | 16°C | 1 chinook fry (35mm), 2 dace. |
| July 17 | 1200 | 15°C | 0 chinook fry, 3 dace. |
| July 18 | 1800 | 16°C | 2 fish. |
| July 19 | 1045 | 15°C | 2 chinook fry (36mm, 38mm). |

Appendix 8. Fence trapping results, Cutoff and Greer creeks, September - November 1980.

CUTOFF CREEK

| Date | Time | Temperature(°C) | Catch | |
|---|---|---|---|---|
| | | | Downstream | Upstream |
| Sept. 8 | 1430 | 10.5 | 13 dace and chub. | 1 chub. |
| Sept. 10 | 1400 | 10 | 3 sucker fry. | 1 chinook fry, 2 dace. |
| Sept. 14 | 1000 | 9.5 | 43 dace, 5 squawfish. | No fish. |
| Sept. 18 | 1400 | 9.0 | 33 dace, 34 squawfish. | 2 dace. |
| Sept. 19 | 1000 | 8.5 | No fish. | 1 dace. |
| Sept. 20 | 1200 | 9.0 | No fish. | No fish. |
| Sept. 21 | 1000 | 8.5 | No fish. | Not operating. |
| Sept. 24 | 1100 | 8.5 | 1 sucker fry. | 1 sucker, 2 squawfish. |
| Sept. 25 | 1400 | 9.0 | No fish. | Not operating. |
| Sept. 30 | 1200 | 8.0 | 1 sucker. | No fish. |
| Oct. 2 | 1500 | 8.0 | No fish. | Not operating. |
| Oct. 6 | 1500 | 7.5 | No fish. | No fish. |
| Nov. 7 | 1600 | 7.0 | No fish. | No fish. |
| Total No. chinook juveniles | | | 0 | 1 |

GREER CREEK

| Date | Time | Temperature(°C) | Catch | |
|---|---|---|---|---|
| | | | Downstream | Upstream |
| Sept. 8 | 1200 | 9 | 12 chinook fry, 1 burbot, 1 rainbow, 71 chub and suckers. | 4 chub. |
| Sept. 14 | 1200 | 9 | 1 chinook fry, 32 dace, 6 squawfish, 15 shiners. | 15 dace. |
| Sept. 18 | 1400 | 8.5 | 41 chinook fry, 28 squawfish, 88 dace, 13 whitefish, 41 shiners, 1 sculpin. | 2 chinook fry, 1 squawfish, 27 dace, 27 shiners. |
| Sept. 19 | 1200 | 8.5 | 4 chinook fry, 13 dace, 4 squawfish, 1 sculpin. | 1 chinook fry, 18 dace, 1 shiner. |
| Sept. 20 | 1000 | 8.5 | 5 chinook fry, 6 dace, 18 shiners, 1 squawfish. | 1 dace. |

Appendix 8 (Cont'd.)

GREER CREEK (Cont'd.)

| Date | Time | Temperature(°C) | Catch Downstream | Upstream |
|---|---|---|---|---|
| Sept. 21 | 1200 | 8.5 | 4 chinook fry, 1 whitefish, 2 dace, 23 shiners, 2 squawfish. | 1 squawfish. |
| Sept. 22 | 1000 | 9 | 7 chinook fry, 1 whitefish, 9 shiners, 1 dace, 2 squawfish. | No fish. |
| Sept. 23 | 1000 | 9 | 6 chinook fry, 22 shiners, 1 rainbow, 5 suckers, 1 burbot, 1 dace, 7 squawfish. | No fish. |
| Sept. 24 | 1200 | 9 | 4 chinook fry, 1 chinook smolt, 1 sucker, 1 whitefish, 1 shiner. | No fish. |
| Sept. 25 | 1200 | 8.5 | 1 chinook fry. | No fish. |
| Sept. 26 | 1000 | 8 | 3 shiners, 1 dace. | 1 shiner. |
| Sept. 27 | 1200 | 9 | 1 chinook fry. | 1 shiner. |
| Sept. 28 | 1200 | 8.5 | 1 chinook fry, 8 shiners, 2 suckers,1 dace, 1 sculpin. | No fish. |
| Sept. 30 | 1100 | 7 | No fish. | No fish. |
| Oct. 2 | 1300 | 8.5 | 2 chinook smolts, 1 1 shiner, 4 whitefish, 1 squawfish. | 1 sucker. |
| Oct. 3 | 1200 | 8 | 1 chinook smolt, 60 shiners, squawfish, suckers, 10 whitefish. | No fish. |
| Oct. 4 | 1100 | 7.5 | 1 rainbow, 30 shiners. | No fish. |
| Oct . 5 | 1400 | 7.0 | 1 dace. | No fish. |
| Total No. chinook juveniles | | | 91 | 3 |

Appendix 9. Estimates of rearing chinook populations in the Nechako tributaries using electroshocking data, June - October 1980.

A. Sampling date - June 27-29, 1980

| Stream | Date | Time | Temp(°C) | No. chinook/ 30m section | Est. No. chinook for entire stream |
|---|---|---|---|---|---|
| Greer Cr. | 27 | 1400 | 15 | 29 | 4,340 |
| Swanson Cr. | 27 | 1600 | 13 | 70 | 10,333 |
| Cutoff Cr.(east) | 27 | 1630 | 19 | 0 | 0 |
| Cutoff Cr.(west) | 27 | 1700 | 17 | 76 | 5,067 |
| Twin Cr. | 27 | 1830 | 10 | 150 | 2,000 |
| Targe Cr. | 29 | 1215 | 13.5 | 20 | 333 |
| | | | | Mean = 58 | Total = 22,073 |

B. Sampling date - July 16-19, 1980

| Stream | Date | Time | Temp(°C) | No. chinook/ 30m section | Est. No. chinook for entire stream |
|---|---|---|---|---|---|
| Twin Cr. | 17 | 1100 | 9 | 100 | 1,530 |
| Cutoff Cr. (east) | 16 | 1400 | 14 | 0 (not accessible) | 0 (not accessible) |
| Cutoff Cr. (west) | 17 | 1200 | 14.5 | 30 | 2,000 |
| Swanson Cr. | 17 | 1400 | 13.5 | 44 | 6,400 |
| Targe Cr. | 17 | 1500 | 17 | 18 | 300 |
| Greer Cr. | 17 | 1545 | 16 | 9 | 1,200 |
| Unnamed Cr. No. 1 | 17 | 1630 | 12 | 34 | 1,933 |
| Tahultzu Cr. | 17 | 1825 | 11.5 | 84 | 840 |
| Unnamed Cr. No. 2 | 17 | 1945 | 16 | 20 | 200 |
| Tatsunai Cr. | 17 | 2130 | 15 | 45 | 750 |
| Unnamed Cr. No. 3 | 19 | 1345 | 16.5 | 18 | 300 |
| Kluk Cr. | 19 | 1410 | 15 | 60 | 1,000 |
| Stony Cr. | 19 | 1530 | 19 | 40 | 3,000 |
| | | | | Mean = 42 | Total = 19,453 |

Appendix 9 (Cont'd.)

In addition to the above streams, 16 Nechako tributaries between the Nautley R. and the Stuart R. confluences contained flowing water. These streams were not electroshocked but their accessible length was determined. If it is assumed that in July the mean number of chinook fry per 30 m of stream was similar for all streams accessible to rearing fry (42 fish/30 m) an estimate of chinook fry abundance in the 16 streams not electroshocked may be made. This estimate and the accessible stream lengths are shown below:

| Stream | Date | Time | Est. accessible length (m) | Est. No. fry |
|---|---|---|---|---|
| 1. Unnamed Cr. No. 4 | July 19 | 1420 | 3,000 | 4,200 |
| 2. Trankle Cr. | July 19 | 1425 | 1,500 | 2,100 |
| 3. Redmond Cr. | July 19 | 1430 | 400 | 560 |
| 4. Moss Cr. | July 19 | 1435 | 500 | 700 |
| 5. Unnamed Cr. No. 5 | July 19 | 1440 | 400 | 560 |
| 6. Clear Cr. | July 19 | 1450 | 100 | 139 |
| 7. Unnamed Cr. No. 6 | July 19 | 1455 | 100 | 139 |
| 8. Murray Cr. | July 19 | 1600 | 600 | 840 |
| 9. Unnamed Cr. No. 7 | July 19 | 1610 | 250 | 350 |
| 10. Neuco Cr. | July 19 | 1620 | 20 | 28 |
| 11. Unnamed Cr. No. 8 | July 19 | 1625 | 500 | 700 |
| 12. Unnamed Cr. No. 9 | July 19 | 1630 | 1,700 | 2,380 |
| 13. Sinkut R. | July 19 | 1640 | 2,000 | 2,800 |
| 14. Unnamed Cr. No. 10 | July 19 | 1645 | 800 | 1,120 |
| 15. Cluculz Cr. | July 19 | 1650 | 3,000 | 4,200 |
| 16. Unnamed Cr. No. 11 | July 19 | 1655 | 1,500 | 2,100 |
| | | Total | 16,370 | 22,916 |

An estimate of chinook fry abundance in July for all the streams tributary to the Nechako River between Cheslatta Falls and the Stuart River confluence (29 out of 96 streams had chinook fry) was 19,453 + 22,916 = 42,369.

C. Sampling date - August 20 - 21, 1980

| Stream | Date | Time | Temp(°C) | No. chinook/ 30m section | Est. No. chinook for entire stream |
|---|---|---|---|---|---|
| Cutoff Cr. (west) | 20 | 1100 | 11.5 | 20 | 1,333 |
| Twin Cr. . | 20 | 1245 | 6 | 80 | 1,077 |
| Swanson Cr. | 21 | 1030 | 10.5 | 42 | 6,067 |
| Greer Cr. | 21 | 1130 | 12.5 | 5 | 767 |
| | | | | Mean = 37 | Total = 9,244 |

Appendix 9 (Cont'd.)

D. Sampling date - Oct. 6 - 7, 1980

| Stream | Date | Time | Temp(°C) | No. chinook/ 30m section | Est. No. chinook for entire stream |
|---|---|---|---|---|---|
| Targe Cr. | 6 | 1100 | - | 0 (no flow) | 0 (no flow) |
| Unnamed Cr. No. 1 | 6 | 1130 | 8.5 | 37 | 2,033 |
| Tahultzu Cr. | 6 | 1200 | 9 | 22 | 220 |
| Unnamed Cr. No. 2 | 6 | 1300 | 8.5 | 25 | 250 |
| Tatsunai Cr. | 6 | 1330 | 8 | 2 | 33 |
| Unnamed Cr. No. 3 | 6 | 1400 | 9 | 15 | 250 |
| Kluk Cr. | 6 | 1500 | 8 | 10 | 167 |
| Twin Cr. | 7 | 1200 | 5.5 | 60 | 800 |
| Cutoff Cr. (west) | 7 | 1300 | 9 | 15 | 1,000 |
| Greer Cr. | 7 | 1430 | 10 | 2 | 367 |
| | | | | Mean = 21 | Total = 5,120 |

If, as in B above, it is assumed that in October the mean number of chinook fry per 30 m of stream was similar for all streams accessible to rearing fry between Cheslatta Falls and the Nechako/Stuart confluence, the following estimate of chinook fry abundance on October 6 - 7, 1980 may be made:

Mean number of fry/30 m in accessible streams electroshocked in October = 21. Total length of streams accessible to chinook fry but not electroshocked was 22,983 m (includes all streams not electroshocked in July plus Swanson and Stony creeks). Therefore, estimated fry abundance for streams not electroshocked in October is 22,983 m ÷ 30 m x 21 fish = 16,088 fish. Total estimated fry abundance for electroshocked and non-electroshocked streams is 5,120 + 16,088 = 21,208.

Appendix 10. Snorkelling observations, Nechako River, 1980.

A. Sampling date June 24 - 25, 1980

| Site | Date | Time | Observations |
|---|---|---|---|
| 1. Cheslatta Falls | 24 | 1500 | 350 chinook fry seen; some in schools as large as 50 in the canyon pool. Many fry seen to defend feeding territories over riffle areas (approx. 1 $m^2$). Several large suckers, whitefish and rainbow trout. |
| 2. Upper spawning area | 24 | 1700 | 75 chinook fry seen; some small schools of 20, most singly defending feeding areas (0-15 cm above gravel). Several large suckers, whitefish, rainbow. |
| 3. Burt Irvine's Lodge | 24 | 1750 | 5 chinook fry defending feeding areas or cruising near the substrate. Numerous suckers, whitefish, rainbow. |
| 4. Cutoff Creek | 24 | 1830 | 0 chinook fry. Several whitefish, suckers, squawfish. |
| 5. Swanson Creek | 25 | 1000 | 40 chinook fry; some small schools mostly over substrate feeding areas. Few suckers, several whitefish and rainbow. |
| 6. Greer Creek | 25 | 1115 | 10 chinook fry; one school of 6. Several suckers, few whitefish and rainbows. |
| 7. Lawrence Creek | 25 | 1140 | 0 chinook fry, few whitefish and suckers. |
| 8. Tahultzu Creek | 25 | 1230 | 30 chinook fry; some small schools, most defending feeding territories (1 $m^2$) over gravel. Several rainbow trout, whitefish, squawfish. |
| 9. Diamond Island | 25 | 1300 | 0 chinook fry. Several juvenile whitefish and rainbow, some suckers. |
| 10. Near seine site No. 13 | 25 | 1400 | 0 chinook fry; several rainbow, whitefish and suckers. |

Appendix 10 (Cont'd.)

B. Sampling date July 17, 19, 1980

| Site | Date | Time | Observations |
|---|---|---|---|
| 1. | 17 | 1000 | 30 chinook fry; some small schools but majority feeding 0 - 15 cm over riffle areas (water flowing at approx. 0.3 m/sec). Several whitefish, squawfish, suckers and about 25 rainbow trout. |
| 2. | 17 | 1100 | 20 chinook fry; 1 school of 15 fish, the rest feeding singly over riffle areas. Several dace, whitefish and squawfish. |
| 3. | 17 | 1200 | 5 chinook fry; feeding or swimming over gravel areas in water flowing at 0.3 m/sec and greater than 0.3 m deep. Numerous small whitefish, dace and suckers. |
| 4. | 17 | 1330 | 2 chinook fry located in riffles; dew dace, 20 whitefish, 6 suckers. |
| 5. | 17 | 1430 | 1 chinook fry sighted over gravel; 20 whitefish, 20 suckers, several dace. |
| 6. | 17 | 1530 | 0 chinook fry; a few whitefish and small suckers. |
| 7. | 19 | 0900 | 4 chinook in riffle areas; 10 rainbow, 100 whitefish (many fry), 20 squawfish, 20 suckers. |
| 8. | 19 | 1030 | 2 chinook fry 15 cm above gravel in fast water; 20 squawfish, 30 suckers. |
| 9. | 19 | 1130 | 2 chinook fry (associated with gravel substrate); several rainbow and whitefish, few suckers and squawfish. |
| 10. | 19 | 1230 | 0 chinook fry; 30 whitefish fry, 5 suckers. |

C. Sampling date July 31 - August 1, 1980

| Site | Date | Time | Observations |
|---|---|---|---|
| 1. | 31 | 0900 | 7 chinook fry in riffle areas greater than 0.3 m deep; 100+ whitefish (many of them fry), 100 suckers, 50 rainbow trout (several juveniles). |
| 2. | 31 | 1000 | 5 chinook fry associated with gravel feeding areas in fast water; 30 rainbow, 100+ whitefish (many fry), several suckers. |
| 3. | 31 | 1130 | 1 chinook fry in fast water; several whitefish, few suckers. |

Appendix 10 (Cont'd.)

C. Sampling date July 31 - August 1, 1980

| Site | Date | Time | Observations |
|---|---|---|---|
| 4. | 31 | 1230 | 1 chinook fry over cobbled area; 20 whitefish, 6 rainbow, numerous suckers. |
| 5. | 31 | Not snorkelled. | |
| 6. | 31 | 1330 | 1 chinook fry (shoreline area, deep water near gravel); 50+ whitefish (many fry). |
| 7. | 1 | 1000 | 3 chinook fry in riffle-run areas; 36 suckers, 60 whitefish, 20 rainbow. |
| 8. | 1 | 1030 | 0 chinook fry; 5 whitefish, few squawfish, suckers, trout. |
| 9. | 1 | 1100 | 0 chinook fry; 20 whitefish, 2 rainbow, 2 suckers. |
| 10. | 1 | 1200 | 0 chinook fry; 1 rainbow, 7 whitefish, 2 suckers. |

D. Sampling date September 10, 19, 1980

| Site | Date | Time | Observations |
|---|---|---|---|
| 1. | 10 | 0930 | 6 chinook fry associated with riffle/run areas over coarse gravel; numerous rainbow, whitefish, suckers, adult chinook. |
| 2. | 10 | 1100 | 0 chinook fry, 4 chinook adults; 20 rainbow, several suckers, whitefish. |
| 3. | 10 | 1230 | 0 chinook fry, 5 chinook adults; numerous rainbow (30+), suckers, whitefish, squawfish. |
| 4. | 10 | 1400 | 1 chinook fry in riffle area, 21 chinook adults; several rainbow, whitefish, suckers, squawfish. |
| 5. | 19 | 0900 | 0 chinook fry, 10 chinook adults; 6 rainbow, 35 whitefish. |
| 5a, b, c, d (several sites between Swanson and Greer Creeks) | | | 4 chinook fry feeding in water greater than 0.3 m deep and flowing at approx. 0.3m/sec; 100+ whitefish, 30 rainbow, 30 adult chinook, several suckers. |

Appendix 11. Daily juvenile chinook catch totals for 2x3 and 4x4 inclined plane traps (IPT), fyke nets (FN) and a fence trap, Nechako River, March - September 1981 (see Fig. 5 for location of traps by number: 1, 2, 7, 8 - IPT's; 3, 4, 5, 6, 9 - FN's).

Upper Nechako River (above Cutoff Cr.)

| 7 & 8 (IPT)[a] | | | | 1 & 2 (IPT) & 3, 4, 5 (FN) | | | 1, 2 (IPT) & 5, 9 (FN) | | | 2, 8 (IPT) | | | 4, 5, 9 (FN) | | | 5,9 (FN) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | No. fish | Date | | No. fish | Date | | No. fish | Date | | No. fish | Date | | No. fish | Date | | No. fish | Date | | No. fish |
| Mar. | 18 | 7 | Apr. | 17 | 429 | Apr. | 16 | 180 | June | 3 | 98 | Aug. | 31 | 0 | Sept. | 9 | 1 | Sept. | 23 | 11 |
| | 19 | 7 | | 18 | 449 | | 17 | 116 | | 4 | - | Sept. | 1 | 0 | | 10 | 3 | | 24 | 5 |
| | 20 | 33 | | 19 | 803 | | 18 | 127 | | 5 | 97 | | 2 | 0 | | 11 | 3 | | 25 | 7 |
| | 21 | 35 | | 20 | 631 | | 19 | 230 | | 6 | 68 | | 3 | 0 | | | 7 | | 26 | 5 |
| | 22 | 29 | | 21 | 1740 | | 20 | 307 | | 7 | 120 | | 4 | 0 | | | | | 27 | 20 |
| | 23 | 175 | | 22 | 1434 | | 21 | 1216 | | 8 | 42 | | 5 | 0 | | | | | 28 | 11 |
| | 24 | 345 | | 23 | 1303 | | 22 | 689 | | 9 | - | | 6 | 0 | | | | | 29 | 13 |
| | 25 | 329 | | 24 | 3374 | | 23 | 1550 | | 10 | 64 | | 7 | 0 | | | | | 30 | 17 |
| | 26 | 570 | | 25 | 1129 | | 24 | 2363 | | | 489 | | 8 | 0 | | | | | | 89 |
| | 27 | 448 | | 26 | 900 | | 25 | 1339 | | | | | 9 | 0 | | | | | | |
| | 28 | 579 | | 27 | 918 | | 26 | 1093 | | | | | 10 | 0 | | | | | | |
| | 29 | 1010 | | 28 | 1854 | | 27 | 990 | | | | | | 0 | | | | | | |
| | 30 | 677 | | 29 | 1776 | | 28 | 2045 | | | | | | | | | | | | |
| | 31 | 799 | | 30 | 2027 | | 29 | 1548 | | | | | | | | | | | | |
| Apr. | 1 | 446 | May | 1 | 1750 | | 30 | 1126 | | | | | | | | | | | | |
| | 2 | 716 | | 2 | 803 | May | 1 | 667 | | | | | | | | | | | | |
| | 3 | 757 | | 3 | 1313 | | 2 | 810 | | | | | | | | | | | | |
| | 4 | 840 | | 4 | 1132 | | 3 | 531 | | | | | | | | | | | | |
| | 5 | 1047 | | 5 | 1308 | | 4 | 632 | | | | | | | | | | | | |
| | 6 | 446 | | 6 | 1126 | | 5 | 579 | | | | | | | | | | | | |
| | 7 | 611 | | 7 | 1079 | | 6 | 860 | | | | | | | | | | | | |
| | 8 | 1226 | | 8 | 797 | | 7 | 620 | | | | | | | | | | | | |
| | 9 | 642 | | 9 | 211 | | 8 | 1167 | | | | | | | | | | | | |
| | 10 | 621 | | 10 | 268 | | | 21,385 | | | | | | | | | | | | |
| | 11 | 1044 | | 11 | 82 | | | | | | | | | | | | | | | |
| | 12 | 95 | | 12 | 173 | May | 27 | 318 | | | | | | | | | | | | |
| | 13 | 200 | | 13 | 94 | | 28 | 401 | | | | | | | | | | | | |
| | 14 | 458 | | 14 | 151 | | 29 | 517 | | | | | | | | | | | | |
| | 15 | 389 | | 15 | 125 | | 30 | 532 | | | | | | | | | | | | |
| | 16 | 745 | | 16 | 95 | | 31 | 445 | | | | | | | | | | | | |
| | | | | | 44,600 | | | 2213 | | | | | | | | | | | | |

Appendix 11 (Cont'd.)

| Nechako River (near Diamond Island) Fence Trap[a] | | | | Lower Nechako River (at Prince George) One 4x4 & one 2x3 (IPT)[a] | | | |
|---|---|---|---|---|---|---|---|
| Date | No. fish | Date | No. fish | Date | No. fish | Date | No. fish |
| May 18 | 21 | June 21 | 1132 | June 13 | 14 | July 17 | 51 |
| 19 | 22 | 22 | 2229 | 14 | 57 | 18 | 39[b] |
| 20 | 16 | 23 | 595 | 15 | - | 19 | 40[b] |
| 21 | 33 | 24 | 1125 | 16 | 35 | 20 | 31[b] |
| 22 | 80 | 25 | 685 | 17 | 46 | 21 | 31[b] |
| 23 | 63 | 25 | 506 | 18 | 32 | 22 | 42[b] |
| 24 | 74 | 27 | 786 | 19 | 37 | 23 | 42[b] |
| 25 | 42 | 28 | 1153 | 20 | 53 | 24 | 18 |
| 26 | 23 | 29 | 507 | 21 | 62 | 25 | 29 |
| 27 | 19 | 30 | 790 | 22 | 80 | 26 | 32 |
| 28 | 10 | July 1 | 377 | 23 | 131 | 27 | 24 |
| 29 | 9 | 2 | 260 | 24 | 87 | 28 | 27 |
| 30 | 409 | 3 | 128 | 25 | 77 | 29 | 18 |
| 31 | 304 | 4 | 206 | 26 | 138 | 30 | 29 |
| June 1 | 168 | 5 | 320 | 27 | 87 | 31 | 20 |
| 2 | 205 | 6 | 160 | 28 | 89 | Aug. 1 | 20 |
| 3 | 180 | 7 | 132 | 29 | 113 | 2 | 14 |
| 4 | 282 | 8 | 177 | 30 | 109 | 3 | 9 |
| 5 | 440 | 9 | 122 | July 1 | 101 | 4 | 12 |
| 6 | 350 | 10 | 117 | 2 | 81 | 5 | 13 |
| 7 | 237 | 11 | 46 | 3 | 125 | 6 | 4 |
| 8 | 246 | 12 | 52 | 4 | 210 | 7 | 10 |
| 9 | 331 | 13 | 68 | 5 | 118 | 8 | 6 |
| 10 | 477 | 14 | 43 | 6 | 104[b] | 9 | 9 |
| 11 | 855 | 15 | 121 | 7 | 105[b] | 10 | 6 |
| 12 | 948 | 16 | 5 | 8 | 113 | 11 | 17 |
| 13 | 1370 | | 31,511 | 9 | 138 | 12 | 16 |
| 14 | 1249 | | | 10 | 70 | 13 | 12 |
| 15 | 2336 | | | 11 | 107 | 14 | 14 |
| 16 | 852 | | | 12 | 96 | 15 | 32 |
| 17 | 1493 | | | 13 | 113 | 16 | 30 |
| 18 | 1176 | | | 14 | 85 | 17 | 6 |
| 19 | 1388 | | | 15 | 79 | 18 | 10 |
| 20 | 3961 | | | 16 | 66 | 19 | 9 |
| | | | | | | 20 | 10 |
| | | | | | | 21 | 4 |
| | | | | | | 22 | 5 |
| | | | | | | 23 | 7 |
| | | | | | | | 3,706 |

[a] Envirocon (1983) unpublished data.
[b] Mean of two days' catch.

Appendix 12. Red marks released upstream of IPT traps No.7 and No.8 near Cutoff Creek (Fig.5 ), Nechako River, 1981 (Envirocon (1981a).[a]

| Date | | Total sprayed | Mark retention | | | No. red marks released[b] |
|---|---|---|---|---|---|---|
| | | | Total held | No. retained | % retained | |
| March | 30 | 300 | 76 | 70 | 92.1 | 176 |
| April | 1 | 429 | 76 | 55 | 72.4 | 252 |
| | 3 | 747 | 72 | 47 | 65.3 | 434 |
| | 4 | 777 | 79 | 43 | 54.4 | 380 |
| | 5 | 994 | -- | -- | 63.1[c] | 613 |
| | 6 | 379 | 53 | 32 | 60.4 | 196 |
| | 7 | 548 | 54 | 52 | 96.3 | 452 |
| | 8 | 1,157 | 95 | 84 | 88.4 | 920 |
| | 9 | 594 | 60 | 52 | 86.7 | 433 |
| | 10 | 558 | 53 | 47 | 88.7 | 408 |
| | 11 | 826 | 78 | 44 | 56.4[d] | 352 |
| | 12 | -- | -- | -- | -- | -- |
| | 13 | 164 | 24 | 22 | 91.7 | 122 |
| | 14 | 391 | 35 | 32 | 91.4 | 315 |
| | 15 | 331 | 45 | 40 | 88.9 | 247 |
| | 16 | 671 | 58 | 51 | 87.9 | 532 |
| | 17 | 330 | 47 | 37 | 78.7 | 209 |
| | 18 | 378 | 43 | 34 | 79.1 | 242 |
| | 19 | 748 | 71 | 51 | 71.8 | 480 |
| | 20 | 561 | 62 | 54 | 87.1 | 416 |
| | 21 | 1,795 | 84 | 68 | 81.0 | 1,359 |
| | 22 | 1,365 | 65 | 61 | 93.9 | 1,194 |
| | 23 | 1,295 | 106 | 68 | 64.2 | 751 |
| | 24 | 3,270 | 64 | 48 | 75.0 | 2,379 |
| | 25 | 1,060 | 61 | 45 | 73.8 | 722 |
| | 26 | 721 | -- | -- | 78.1[e] | 519 |
| | 27 | 840 | 50 | 33 | 66.0 | 516 |
| | 28 | 1,772 | 97 | 59 | 60.8 | 999 |
| | 29 | 1,596 | -- | -- | 87.1[f] | 1,393 |
| | 30 | -- | -- | -- | -- | -- |
| May | 1 | 1,671 | 136 | 125 | 91.9 | 1,327 |
| | 2 | -- | -- | -- | -- | -- |
| | 3 | 1,210 | 68 | 66 | 97.1 | 1,105 |
| | 4 | 1,704 | 76 | 64 | 84.2 | --[g] |
| | 5 | 1,226 | 79 | 70 | 88.6 | 930 |
| | 6 | 1,053 | 92 | 68 | 73.9 | 705 |
| | 7 | 1,104 | 68 | 56 | 82.4 | 845 |
| | 8 | 665 | 91 | 91 | 100.0 | 566 |
| | 9 | 762 | 79 | 75 | 94.9 | 648 |
| Total | | 33,993 | -- | -- | -- | 23,137 |

[a] From Envirocon 1981a; Table 24.

[b] Number of marks released were calculated by subtracting from the total numbers sprayed the post-spray mortalities and samples taken for mark retention and multiplying the difference by percent mark retention.

[c] Average of April 1-6.

[d] Ice conditions.

[e] Average retention of April 20-26.

[f] Average retention of May 1-6.

[g] 1402 marks released downstream of the traps.

Appendix 13. Chinook fry captured by IPT traps No. 1 and No. 2 near Twin Creek (Fig. 5 ) and released just downstream as red marks, Nechako River, 1981 (Envirocon 1981a).[a]

| Date | | No. sprayed | % Mark retention | No. marks released |
|---|---|---|---|---|
| April | 20 | 770 | 87.1 | 671 |
| | 21 | 1,182 | 81.0 | 958 |
| | 22 | 677 | 93.9 | 636 |
| | 23 | 1,362 | 64.2 | 874 |
| | 24 | 2,318 | 75.0 | 1,739 |
| | 25 | -- | -- | -- |
| | 26 | -- | -- | -- |
| | 27 | 3,775[b] | 66.0 | 2,459[b] |
| | 28 | -- | -- | -- |
| | 29 | -- | -- | -- |
| | 30 | -- | -- | -- |
| May | 1 | 5,238 | 91.9 | 4,815 |
| | 2 | 807 | 87.8 | 709 |
| | 3 | -- | -- | -- |
| | 4 | 950 | 84.2 | 800 |
| | 5 | -- | -- | -- |
| | 6 | -- | -- | -- |
| | 7 | -- | -- | -- |
| | 8 | -- | -- | -- |
| | 9 | 1,893 | 94.9 | 1,787 |
| | Total | 18,972 | -- | 12,989 red marks<br>2,459 green marks |

[a] From Envirocon 1981[a]; Table 21.
[b] Green marks released upstream of IPT traps No. 1 and No. 2 (Fig. 5).

Appendix 14. Summary of grit marking of chinook fry at Diamond Island fence trap, Nechako River, 1981 (Envirocon 1981a).[a]

| Date | No. sprayed | Mark retention No. held | Mark retention % | No. marks released |
|---|---|---|---|---|
| **GREEN GRIT (released downstream of trap)** | | | | |
| May 18-30 | 497 | 78 | 98.7 | 421 |
| 31 | 295 | 82 | 97.6 | 264 |
| June 1 | 110 | 68 | 97.1 | 84 |
| 2 | 106 | 40 | 92.5 | 92 |
| 3 | 106 | 60 | 85.0 | 76 |
| 4 | 56 | 56 | 100.0 | 48 |
| 5 | 199 | 71 | 97.2 | 185 |
| 6 | 196 | 82 | 91.5 | 158 |
| 7 | 140 | 81 | 100.0 | 94 |
| 8 | 160 | 66 | 86.4 | 116 |
| 9 | 292 | 86 | 96.5 | 242 |
| 10 | 421 | 69 | 92.8 | 357 |
| 11 | 772 | 111 | 89.2 | 661 |
| 12 | 451 | 85 | 98.8 | 355 |
| 13 | 994 | 70 | 100.0 | 917 |
| 14 | 1,122 | 75 | 98.7 | 1,091 |
| 15 | 528 | 92 | 100.0 | 416 |
| Total | - | - | - | 4,916[b] |
| **ORANGE GRIT (released upstream of trap)** | | | | |
| June 15 | 1,390 | 88 | 98.9 | 1,216 |
| 16 | 718 | 53 | 100.0 | 551 |
| 17 | 1,258 | 192 | 99.5 | 1,023 |
| 18-19 | 2,359 | 75 | 98.7 | 2,063 |
| 20-21 | 3,698 | 50 | 92.0 | 3,126 |
| 22-23 | 1,844 | 16 | 87.5 | 1,433 |
| 24-25 | 1,404 | 104 | 83.7 | 1,050 |
| 26-27 | 1,108 | 133 | 85.7 | 768 |
| 28-29 | 1,504 | 137 | 98.5 | 1,321 |
| 30- 1 | 1,027 | - | 94.9 | 918 |
| July 2- 3 | 409 | 115 | 96.5 | -[c] |
| 4- 5 | 387 | 97 | 88.7 | 257 |
| 6- 7 | 241 | 42 | 100.0 | 194 |
| 8- 9 | 241 | 47 | 97.9 | 178 |
| 10-13 | 123 | - | - | - |
| Total | - | - | - | 14,098[c] |

[a] From Envirocon 1981a; Tables 26 and 27.
[b] Additional 1,215 fish were used for long-term mark retention study.
[c] Additional 1,148 fish were used for long-term mark retention study.

Appendix 15. Recovery of red-marked chinook fry at IPT traps No. 7 and No. 8 at Cutoff Creek (Fig. 5), Nechako River, 1981 (Envirocon 1981a).[a]

| Date | No. marks released | Catch next day | | | |
|---|---|---|---|---|---|
| | | IPT No. 7 | | IPT No. 8 | |
| | | Total catch | No. marks | Total catch | No. marks |
| March 30 | 176 | 579 | 1 | 220 | 0 |
| 31 | -- | 400 | 0 | 46 | 0 |
| April 1 | 353 | 632 | 0 | 84 | 0 |
| 2 | -- | 549 | 0 | 208 | 0 |
| 3 | 434 | 732 | 0 | 108 | 3 |
| 4 | 380 | 879 | 3 | 168 | 1 |
| 5 | 613 | 296 | 1 | 150 | 3 |
| 6 | 196 | 480 | 2 | 131 | 0 |
| 7 | 452 | 1,008 | 2 | 218 | 2 |
| 8 | 920 | 501 | 2 | 141 | 0 |
| 9 | 433 | 547 | 0 | 74 | 0 |
| 10 | 408 | 544 | 1 | 500 | 1 |
| 11 | 352 | 52 | 0 | 43 | 0 |
| 12 | -- | 65 | 0 | 135 | 0 |
| 13 | 122 | 201 | 1 | 257 | 1 |
| 14 | 315 | 69 | 0 | 320 | 1 |
| 15 | 247 | 276 | 0 | 469 | 2 |
| 16 | 532 | 119 | 0 | 310 | 0 |
| 17 | 209 | 192 | 2 | 257 | 0 |
| 18 | 242 | 240 | 1 | 563 | 0 |
| 19 | 480 | 180 | 1 | 451 | 2 |
| 20 | 416 | 692 | 3 | 1,048 | 2 |
| 21 | 1,859 | 733 | 7 | 701 | 4 |
| 22 | 1,194 | 637 | 9 | 666 | 6 |
| 23 | 751 | 1,411 | 15 | 1,963 | 16 |
| 24 | 2,379 | 666 | 10 | 463 | 6 |
| 25 | 722 | 475 | 5 | 425 | 6 |
| 26 | 519 | 257 | 8 | 661 | 5 |
| 27 | 516 | 996 | 5 | 858 | 4 |
| 28 | 999 | 954 | 8 | 822 | 6 |
| 29 | 1,393 | 1,083 | 9 | 944 | 12 |
| 30 | -- | 1,041 | 2 | 709 | 2 |
| May 1 | 1,327 | 668 | 4 | 135 | 2 |
| 2 | -- | 773 | 1 | 540 | 0 |
| 3 | 1,105 | 445 | 2 | 687 | 7 |
| 4 | -- | 765 | 4 | 543 | 1 |
| 5 | 930 | 692 | 6 | 434 | 4 |
| 6 | 705 | 700 | 6 | 379 | 4 |
| 7 | 845 | 430 | 4 | 367 | 7 |
| 8 | 566 | 93 | 1 | 118 | 0 |
| 9 | 648 | 156 | 6 | 112 | 8 |
| 10 | 0 | 29 | 0 | 53 | 0 |
| 11 | 0 | 67 | 0 | 106 | 0 |
| 12 | 0 | 54 | 2 | 40 | 0 |
| 13 | 0 | 73 | 0 | 78 | 0 |
| 14 | 0 | 44 | 0 | 81 | 0 |
| 15 | 0 | 39 | 2 | 56 | 0 |
| Total | 23,137 | 22,514 | 136 | 17,842 | 118 |

a From Envirocon 1981a; Table 24 (Revised 1983).

Appendix 16. Daily mark recaptures by colour at Diamond Island fence, Nechako River, 1981 (Envirocon 1981a).[a]

| Date | | RED (released above Cutoff Creek) | GREEN (released below fence trap) | ORANGE (released above fence trap) |
|---|---|---|---|---|
| May | 18 | 0 | | |
| | 19 | 1 | | |
| | 20 | 0 | | |
| | 21 | 0 | | |
| | 22 | 0 | | |
| | 23 | 0 | | |
| | 24 | 0 | | |
| | 25 | 0 | | |
| | 26 | 0 | | |
| | 27 | 1 | | |
| | 28 | 0 | | |
| | 29 | 1 | | |
| | 30 | 0 | | |
| | 31 | 1 | | |
| June | 1 | 0 | | |
| | 2 | 1 | 1 | |
| | 3 | 0 | 1 | |
| | 4 | 0 | 0 | |
| | 5 | 1 | 1 | |
| | 6 | 4 | 1 | |
| | 7 | 0 | 2 | |
| | 8 | 0 | 0 | |
| | 9 | 0 | 0 | |
| | 10 | 0 | 1 | |
| | 11 | 4 | 0 | |
| | 12 | 1 | 7 | |
| | 13 | 4 | 0 | |
| | 14 | 1 | 1 | |
| | 15 | 4 | 16 | |
| | 16 | 0 | 2 | 24 |
| | 17 | 4 | 3 | 38 |
| | 18 | 0 | 1 | 53 |
| | 19 | 0 | 1 | 20 |
| | 20 | 2 | 0 | 127 |
| | 21 | 1 | 0 | 47 |
| | 22 | 2 | 0 | 106 |
| | 23 | 2 | 0 | 22 |
| | 24 | 0 | 1 | 67 |
| | 25 | 0 | 0 | 4 |
| | 26 | 0 | 0 | 9 |
| | 27 | 3 | 0 | 19 |
| | 28 | 0 | 1 | 32 |
| | 29 | 0 | 1 | 3 |
| | 30 | 0 | 0 | 60 |
| July | 1 | 1 | 0 | 4 |
| | 2 | 0 | 0 | 14 |
| | 3 | 0 | 0 | 4 |
| | 4 | 0 | 0 | 0 |
| | 5 | 0 | 0 | 0 |
| | 6 | 0 | 0 | 4 |
| | 7 | 1 | 0 | 1 |
| | 8 | 0 | 0 | 9 |
| | 9 | 0 | 0 | 1 |
| | 10 | 0 | 0 | 4 |
| | 11 | 0 | 0 | 0 |
| | 12 | 0 | 0 | 0 |
| | 13 | 0 | 0 | 0 |
| | 14 | 0 | 0 | 1 |
| | 15 | 0 | 0 | 1 |
| | 16 | 0 | 0 | 0 |
| Total | | 40 | 41 | 674 |

[a] From Envirocon 1981a: Table 23.

Appendix 17a. Lengths and weights of chinook juveniles captured in Nechako mainstem, April - November 1980 (n gives sample size).

| Beach seining site | n | Length (cm) Mean | Range | S.D. | Weight (g) Mean | Range | S.D. |
|---|---|---|---|---|---|---|---|
| | | April 30 | | | | | |
| 5A | 25 | 3.6 | - | - | - | - | - |
| | | June 24 - 28 | | | | | |
| 1 | 20 | 5.9 | 5.3-7.3 | 0.47 | 2.7 | 1.9-5.2 | 0.76 |
| 2 | 2 | 7.2 | 7.2-7.2 | 0 | 4.7 | 4.6-4.8 | 0.14 |
| 3 | 20 | 5.5 | 5.0-6.0 | 0.32 | 2.1 | 1.6-2.8 | 0.36 |
| 3A | 13 | 6.2 | 5.2-6.7 | 0.41 | 2.9 | 1.7-3.5 | 0.48 |
| 5 | 3 | 5.9 | 5.2-6.5 | 0.65 | 2.6 | 1.7-3.7 | 1.01 |
| 5A | 7 | 6.1 | 5.7-6.6 | 0.38 | 3.0 | 2.3-3.8 | 0.64 |
| 6 | 10 | 5.8 | 4.8-6.4 | 0.45 | 2.6 | 1.4-3.5 | 0.60 |
| 7 | 5 | 6.4 | 5.9-7.1 | 0.57 | 3.4 | 2.5-4.7 | 1.02 |
| 8 | 12 | 6.3 | 5.6-6.8 | 0.40 | 3.3 | 2.3-4.7 | 0.76 |
| 10 | 7 | 6.3 | 5.8-7.0 | 0.47 | 3.3 | 2.1-4.5 | 0.87 |
| 11 | 2 | 5.3 | 4.9-5.6 | 0.50 | 1.8 | 1.4-2.1 | 0.35 |
| 12 | 2 | 5.9 | 5.7-6.0 | 0.21 | 3.0 | 2.4-3.5 | 0.78 |
| 13 | 1 | 6.3 | - | - | 3.2 | - | - |
| 14 | 3 | 5.4 | 4.1-6.4 | 1.17 | 2.2 | 0.8-3.5 | 1.35 |
| 15 | 1 | 5.1 | - | - | 1.8 | - | - |
| 16 | 10 | 5.9 | 4.9-7.0 | 0.68 | 2.8 | 1.5-4.7 | 1.11 |
| 22 | 19 | 6.1 | 5.5-7.1 | 0.40 | 2.8 | 2.0-4.6 | 0.62 |
| 23 | 9 | 6.0 | 5.4-6.7 | 0.41 | 2.8 | 2.1-4.0 | 0.65 |
| 24 | 15 | 6.2 | 5.4-7.5 | 0.55 | 2.9 | 1.8-5.3 | 0.85 |
| Total | 161 | - | - | - | - | - | - |
| Mean[a] | 15 | 6.0 | 5.4-6.4 | 0.28 | 2.8 | 2.1-3.4 | 0.37 |

[a] Mean of means where n ≥ 3; smaller samples were pooled and treated as one sample.

| Beach seining site | n | Length (cm) Mean | Range | S.D. | Weight (g) Mean | Range | S.D. |
|---|---|---|---|---|---|---|---|
| | | July 16 - 19 | | | | | |
| 1 | 7 | 6.9 | 5.9-7.6 | 0.56 | 4.3 | 2.7-5.6 | 1.05 |
| 3A | 4 | 6.9 | 6.6-7.5 | 0.42 | 4.2 | 3.6-5.4 | 0.83 |
| 5 | 2 | 7.4 | 7.3-7.5 | 0.14 | 5.3 | 5.2-5.4 | 0.14 |
| 8 | 1 | 6.9 | - | - | 4.0 | - | - |
| 22 | 9 | 7.4 | 6.5-8.4 | 0.75 | 5.5 | 3.3-7.8 | 1.77 |
| 23 | 11 | 6.5 | 5.1-7.9 | 0.88 | 3.8 | 1.3-6.5 | 1.65 |
| IPT | 2 | 3.4 | 3.3-3.4 | 0.07 | 0.5 | 0.4-0.5 | 0.07 |
| Total | 36 | - | - | - | - | - | - |
| Mean[a] (excludes IPT sample) | 5 | 7.0 | 6.5-7.4 | 0.34 | 4.5 | 3.8-5.5 | 0.67 |
| | | July 31 - August 1 | | | | | |
| 3 | 1 | 7.4 | - | - | 4.1 | - | - |
| 3A | 1 | 8.0 | - | - | 6.3 | - | - |
| 4 | 1 | 8.2 | - | - | 6.6 | - | - |
| 5A | 1 | 7.1 | - | - | 4.1 | - | - |
| 13 | 10 | 7.5 | 6.8-8.5 | 0.66 | 5.3 | 3.7-7.3 | 1.43 |
| 20 | 1 | 9.4 | - | - | 11.1 | - | - |
| 22 | 2 | 8.0 | 7.3-8.7 | 0.99 | 6.4 | 4.6-8.1 | 2.47 |
| Total | 17 | - | - | - | - | - | - |
| Mean[a] | 2 | 7.8 | 7.5-8.0 | 0.35 | 5.9 | 5.3-6.4 | 0.78 |
| | | August 10 - 13 | | | | | |
| 3 | 3 | 8.4 | 7.6-9.3 | 0.86 | 8.1 | 5.9-10.9 | 2.54 |
| 20 | 7 | 7.8 | 7.2-8.9 | 0.66 | 6.2 | 4.7- 9.5 | 1.75 |
| Total | 10 | - | - | - | - | - | - |
| Mean | 2 | 8.1 | 7.8-8.4 | 0.42 | 7.2 | 6.2-8.1 | 1.34 |
| | | November 25 | | | | | |
| 3 | 1 | 7.0 | - | - | 3.9 | - | - |

Appendix 17b. Lengths and weights of chinook juveniles captured in Nechako tributaries, June to October 1980 (n gives sample size).

| Site | n | Length (cm) Mean | Range | S.D. | Weight (g) Mean | Range | S.D. |
|---|---|---|---|---|---|---|---|
| **June 27 - 28** | | | | | | | |
| Twin Cr. | 21 | 4.5 | 3.5-5.8 | 0.65 | 1.1 | 0.5-2.9 | 0.61 |
| Cutoff Cr. | 20 | 5.8 | 4.8-6.8 | 0.60 | 2.5 | 1.4-3.8 | 0.83 |
| Swanson Cr. | 20 | 6.3 | 5.6-7.0 | 0.38 | 3.4 | 2.4-4.8 | 0.65 |
| Greer Cr. | 19 | 5.8 | 5.0-7.0 | 0.50 | 2.4 | 1.4-4.5 | 0.75 |
| Targe Cr. | 16 | 5.9 | 5.3-6.6 | 0.41 | 2.4 | 1.4-3.6 | 0.69 |
| Total | 96 | - | - | - | - | - | - |
| Mean | 5 | 5.1 | 4.5-6.3 | 0.68 | 2.4 | 1.1-3.4 | 0.82 |
| **July 17-19** | | | | | | | |
| Cutoff Cr. | 10 | 6.7 | 5.3-7.6 | 0.62 | 4.1 | 1.9-4.5 | 1.07 |
| Swanson Cr. | 10 | 7.3 | 6.8-8.2 | 0.40 | 5.3 | 4.4-7.9 | 1.03 |
| Greer Cr. | 10 | 6.2 | 5.6-6.9 | 0.49 | 3.1 | 2.2-4.4 | 0.82 |
| Targe Cr. | 10 | 6.7 | 6.0-7.7 | 0.53 | 4.3 | 3.1-6.1 | 1.05 |
| No. 1 Cr. | 12 | 5.6 | 4.6-6.5 | 0.55 | 2.5 | 1.7-3.5 | 0.68 |
| Tahultzu Cr. | 12 | 5.7 | 4.7-6.8 | 0.69 | 2.6 | 1.4-4.1 | 0.84 |
| Tatsunai Cr. | 10 | 5.2 | 4.5-5.6 | 0.36 | 1.9 | 1.2-2.4 | 0.36 |
| No. 2 Cr. | 10 | 6.0 | 5.0-7.6 | 0.93 | 3.1 | 1.7-5.9 | 1.41 |
| No. 3 Cr. | 10 | 6.1 | 4.6-7.6 | 0.80 | 3.2 | 1.3-6.7 | 1.44 |
| Kluk Cr. | 16 | 5.1 | 3.0-10.0 | 1.75 | 2.1 | 0.3-10.2 | 2.35 |
| Stony Cr. | 4 | 6.7 | 6.0-7.5 | 0.62 | 3.9 | 2.7-5.8 | 1.34 |
| Total | 114 | - | - | - | - | - | - |
| Mean | 11 | 6.1 | 5.1-7.3 | 0.69 | 3.3 | 1.9-5.3 | 1.03 |
| **August 20 - 21** | | | | | | | |
| Twin Cr. | 10 | 5.6 | 4.3-6.4 | 0.70 | 2.1 | 0.9-3.2 | 0.68 |
| Cutoff Cr. | 10 | 7.0 | 6.3-7.6 | 0.44 | 4.7 | 3.1-6.3 | 1.08 |
| Swanson Cr. | 10 | 7.8 | 6.9-8.5 | 0.58 | 6.3 | 4.0-8.3 | 1.41 |
| Greer Cr. | 6 | 7.0 | 6.2-8.1 | 0.64 | 4.7 | 3.0-7.2 | 1.41 |
| Total | 36 | - | - | - | - | - | - |
| Mean | 4 | 6.9 | 5.6-7.8 | 0.91 | 4.5 | 4.5-6.3 | 1.74 |
| **October 6 - 7** | | | | | | | |
| Cutoff Cr. | 4 | 8.0 | 7.5-8.9 | 0.65 | 6.4 | 5.1-8.2 | 1.29 |
| Greer Cr. | 2 | 8.3 | 8.1-8.5 | 0.28 | 6.2 | 5.8-6.5 | 0.50 |
| Tahultzu Cr. | 7 | 6.4 | 5.6-7.8 | 0.67 | 2.9 | 1.9-4.2 | 0.72 |
| Tatsunai Cr. | 3 | 6.8 | 5.4-8.1 | 1.35 | 3.8 | 1.8-5.9 | 2.06 |
| No. 2 Cr. | 7 | 6.3 | 5.9-7.2 | 0.45 | 3.1 | 2.5-4.4 | 0.64 |
| Kluk Cr. | 6 | 6.5 | 5.8-7.1 | 0.48 | 3.3 | 2.7-4.2 | 0.62 |
| Total | 29 | - | - | - | - | - | - |
| Mean | 6 | 7.1 | 6.4-8.3 | 0.87 | 4.3 | 2.9-6.4 | 1.59 |

Appendix 18. Lengths and weights of chinook juveniles captured in Nechako mainstem, March - September 1981 (n gives sample size) (Envirocon 1981a)[a].

| Date | n | Length (cm) | | | Weight (g) | | | Method of capture[b] |
|---|---|---|---|---|---|---|---|---|
| | | Mean | Range | SD | Mean | Range | SD | |
| March 22 | 25 | — | — | — | 0.39 | 0.24-0.52 | 0.06 | IPT |
| 30 | 50 | 3.8 | 3.5-4-2 | 0.14 | 0.39 | 0.28-0.50 | 0.05 | IPT |
| 31 | 50 | 3.8 | 3.6-4.1 | 0.11 | 0.39 | 0.32-0.48 | 0.04 | IPT |
| April 1 | 50 | 3.8 | 3.6-4.0 | 0.10 | 0.38 | 0.31-0.47 | 0.04 | IPT |
| 2 | 50 | 3.8 | 3.5-4.1 | 0.14 | 0.37 | 0.25-0.51 | 0.07 | IPT |
| 3 | 50 | 3.8 | 3.4-4.2 | 0.14 | 0.37 | 0.22-0.44 | 0.06 | IPT |
| 4 | 50 | 3.8 | 3.6-4.3 | 0.13 | 0.39 | 0.31-0.53 | 0.04 | IPT |
| 5 | 50 | 3.8 | 3.4.4.0 | 0.12 | 0.39 | 0.23-0.46 | 0.05 | IPT |
| 6 | 50 | 4.0 | 3.6-4.2 | 0.15 | 0.40 | 0.30-0.57 | 0.06 | IPT |
| 7 | 50 | 3.9 | 3.7-4.2 | 0.12 | 0.41 | 0.32-0.48 | 0.04 | IPT |
| 8 | 50 | 3.9 | 3.6-4.2 | 0.12 | 0.41 | 0.32-0.51 | 0.04 | IPT |
| 9 | 51 | 3.8 | 3.5-4.2 | 0.15 | 0.39 | 0.27-0.52 | 0.06 | IPT |
| 10 | 50 | 3.8 | 3.6-4.1 | 0.14 | 0.39 | 0.26-0.53 | 0.06 | IPT |
| 11 | 50 | 3.8 | 3.5-4.0 | 0.15 | 0.38 | 0.25-0.47 | 0.06 | IPT |
| 12 | 48 | 3.8 | 3.2-4.2 | 0.12 | 0.39 | 0.23-0.51 | 0.06 | IPT |
| 13 | 50 | 3.8 | 3.4-4.0 | 0.15 | 0.38 | 0.23-0.48 | 0.05 | IPT |
| 14 | 50 | 3.8 | 3.2-4.2 | 0.19 | 0.39 | 0.19-0.54 | 0.06 | IPT |
| 15 | 51 | 3.9 | 3.6-4.2 | 0.15 | 0.38 | 0.20-0.50 | 0.05 | IPT |
| 16 | 50 | 3.9 | 3.6-4.3 | 0.16 | 0.41 | 0.28-0.57 | 0.06 | IPT |
| 18 | 50 | 3.9 | 3.5-4.6 | 0.16 | 0.40 | 0.28-0.76 | 0.08 | IPT |
| 19 | 50 | 3.8 | 3.5-4.2 | 0.15 | 0.39 | 0.29-0.61 | — | IPT |
| 20 | 50 | 3.8 | 3.4-4.1 | 0.15 | 0.39 | 0.27-0.53 | 0.05 | IPT |
| 21 | 50 | 3.9 | 3.4-4.2 | 0.27 | 0.43 | 0.23-0.70 | 0.08 | IPT |
| 22 | 50 | 3.9 | 3.5-4.2 | 0.17 | 0.39 | 0.31-0.54 | 0.06 | IPT |
| 23 | 50 | 3.8 | 3.5-4.1 | 0.13 | 0.38 | 0.24-0.51 | 0.05 | IPT |
| 24 | 50 | 3.8 | 3.6-4.2 | 0.13 | 0.39 | 0.29-0.57 | 0.05 | IPT |
| 27 | 50 | 3.5 | 3.2-3.9 | 0.18 | 0.38 | 0.24-0.54 | 0.07 | BS |
| 26 | 50 | — | — | — | 0.38 | 0.29-0.45 | 0.05 | IPT |
| 27 | 50 | 3.8 | 3.4-4.9 | 0.22 | 0.38 | 0.24-0.93 | 0.09 | IPT |
| 28 | 50 | 3.8 | 3.5-4.0 | 0.13 | 0.38 | — | — | IPT |
| 28 | 29 | 3.7 | 3.3-3.9 | 0.12 | 0.46 | 0.31-0.56 | 0.05 | BS |
| 30 | 50 | 3.8 | 3.5-4.7 | 0.21 | 0.38 | 0.26-0.78 | 0.09 | IPT |
| 30 | 30 | 3.7 | 3.2-4.0 | 0.16 | 0.44 | 0.29-0.67 | 0.07 | BS |
| May 1 | 50 | 3.7 | 3.4-4.3 | 0.17 | 0.36 | 0.22-0.55 | 0.06 | IPT |
| 2 | 50 | 3.8 | 3.3-4.3 | 0.19 | 0.29 | 0.22-0.63 | 0.08 | IPT |
| 3 | 50 | 3.8 | 3.4-4.2 | 0.13 | 0.39 | 0.28-0.51 | 0.05 | IPT |
| 4 | 50 | 3.8 | 3.4-4.4 | 0.18 | 0.39 | 0.22-0.69 | 0.08 | IPT |
| 5 | 50 | 3.8 | 3.4-4.3 | 0.21 | 0.37 | 0.26-0.55 | 0.06 | IPT |
| 5 | 25 | 3.9 | 3.4-4.4 | 0.22 | 0.44 | 0.27-0.66 | 0.09 | FN |
| 6 | 50 | 3.9 | 3.4-4.4 | 0.23 | 0.40 | 0.26-0.63 | 0.09 | IPT |
| 8 | 50 | 3.9 | 3.3-4.5 | 0.29 | 0.42 | 0.21-0.85 | 0.14 | IPT |
| 31 | 30 | 4.6 | 3.1-5.5 | 0.45 | 0.81 | — | — | IPT |
| June 5 | 29 | 4.3 | 3.3-5.5 | 0.37 | 0.62 | — | — | BS |
| 5 | 31 | 4.3 | 3.1-5.2 | 0.28 | 0.66 | 0.20-1.09 | 0.13 | BS |
| 7 | 6 | 4.5 | 4.2-5.3 | 0.27 | 0.60 | 0.50-0.66 | 0.64 | BS |
| 7 | 30 | 5.0 | 4.3-6.3 | 0.32 | 1.19 | 0.71-2.50 | 0.24 | IPT |
| 10 | 30 | 5.1 | 4.2-6.8 | 0.46 | 1.31 | 0.59-3.18 | 0.41 | IPT |
| July 20 | 25 | 6.8 | 5.8-8.6 | 0.62 | 3.56 | — | — | IPT |

Appendix 18 (Cont'd.)

| Date | | n | Length (cm) | | | Weight (g) | | | Method of capture [a] |
|---|---|---|---|---|---|---|---|---|---|
| | | | Mean | Range | SD | Mean | Range | SD | |
| Sept. | 1 | 27 | 8.9 | 7.5-10.2 | 0.73 | 9.97 | — | — | BS |
| | 3 | 18 | 9.7 | 8.5-11.2 | 0.66 | 13.46 | — | — | BS |
| | 3 | 10 | 9.2 | 7.9-10.2 | 0.64 | 11.13 | — | — | BS |
| | 4 | 10 | 9.3 | 7.5-10.3 | 0.62 | 11.59 | — | — | BS |
| | 10 | 22 | 8.9 | 7.8-9.9 | 0.60 | 9.97 | — | — | BS |
| | 11 | 44 | 8.8 | 7.4-9.9 | 0.50 | 9.21 | — | — | FN |
| | 23 | 11 | 9.5 | 9.0-10.1 | 0.34 | 12.43 | — | — | FN |
| | 24 | 5 | 9.2 | 8.5-10.5 | 1.44 | 11.13 | — | — | FN |
| | 25 | 7 | 9.9 | 8.5-12.5 | 1.29 | 14.59 | — | — | FN |
| | 26 | 5 | 9.6 | 8.8-10.6 | 0.64 | 12.94 | — | — | FN |
| | 27 | 20 | 9.2 | 8.0-11.7 | 0.58 | 11.13 | — | — | FN |
| | 28 | 10 | 9.1 | 8.1-11.1 | 0.69 | 10.70 | — | — | FN |
| | 29 | 13 | 9.6 | 8.4-10.8 | 0.62 | 12.94 | — | — | FN |
| | 30 | 17 | 9.1 | 8.0-10.8 | 0.51 | 10.70 | — | — | FN |

[a] From Envirocon 1981a; Table 1 (March 22-May 8).
[b] IPT - inclined plane trap; BS - beach seine; FN - fyke net.

Appendix 19. Scale analysis of chinook juveniles captured in Nechako mainstem at Cutoff Creek, 1981 (n gives sample size).

| Date | n | Length (mm) | | Comments |
|---|---|---|---|---|
| | | Mean | Range | |
| | | AGE 0+ (DFO data) | | |
| July 20 | 25 | 68 | 52-86 | 7-10 circuli laid down to date. |
| Sept. 4 | 8 | 94 | 75-108 | Stress indicated by circuli in mid-summer 1981. |
| Sept. 10 | 19 | 90 | 80-97 | As above. |
| Sept. 11 | 10 | 90 | 82-99 | As above. |
| | | AGE 1+ (Envirocon data) | | |
| April 2-5 | 3 | 100 | 92-106 | Stress indicated by circuli in mid-summer 1980. |
| April 21-24 | 6 | 96 | 88-122 | As above. |
| May 30-31 | 7 | 94 | 83-113 | As above. |
| June 1-9 | 26 | 101 | 88-125 | As above. |
| June 10-21 | 27 | 95 | 78- 119 | As above. |

Appendix 20. Stomach contents of chinook juveniles, Nechako River system, 1980; data for all fish sampled at each site (n usually 10) are pooled.

A. June 24 - 28

| Site | 1 | 2 | 3 | 5 | 12 | 14 | 15 | Targe Cr. |
|---|---|---|---|---|---|---|---|---|
| Organism | | | | | | | | |
| Chironomidae | | | | | | | | |
| larva | | 4 | | 3 | 2 | 1 | 2 | 30 |
| pupa | 5 | 6 | 3 | 4 | 4 | | 6 | 48 |
| adult | 15 | 2 | 30 | 1 | | | 3 | |
| Ceratopogonidae | | | | | | | | |
| larva | | | | | | | | |
| pupa | | | 5 | | | | | 1 |
| adult | | 1 | 2 | | | | | |
| Ephemeroptera | | | | | | | | |
| nymph | 3 | 6 | 32 | 7 | 1 | 11 | 10 | 42 |
| adult | | | | | | | | 2 |
| Plecoptera | | | | | | | | |
| nymph | | | 1 | | | 1 | | 8 |
| adult | | | | | | | | |
| Trichoptera | | | | | | | | |
| larva | | 6 | 2 | 5 | 3 | 3 | 1 | 12 |
| adult | | 1 | 1 | | | 1 | 3 | |
| Simulium sp. | | | | | | | | |
| larva | | | | | | 2 | | 3 |
| adult | 1 | | 2 | 1 | | 4 | | |
| Terrestrial spp. | 2 | | 5 | | | 2 | 1 | 4 |
| Amphipoda | | 1 | | | | 1 | | |
| Acari | 29 | | | | | 1 | | 1 |
| Mollusca | | 1 | | | | | | |
| Total No. organisms | 55 | 28 | 83 | 21 | 10 | 27 | 26 | 151 |
| Total No. taxa | 5 | 6 | 7 | 4 | 3 | 8 | 4 | 8 |

Appendix 20 (Cont'd.)

B. July 16 - 19

| Site | | 1 | 3A | 5 | 5A | 8 | 11 | 20 | 22 | 23 | IPT site |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stomach fullness | | full | 3/4 | full | full | full | full | 1/2 | full | full | full |
| Organism | | | | | | | | | | | |
| Ephemeroptera | | | | | | | | | | | |
| Baetidae | nymph | 5 | 26 | 70 | | | | | 370 | 11 | 3 |
| Unident. | nymph | 7 | 12 | | | 1 | 3 | | | 20 | 1 |
| Ephemerella sp. | nymph | | 2 | | | | | | | | |
| Heptagenia sp. | nymph | | 13 | | | | | | | | |
| Plecoptera | | | | | | | | | | | |
| Unident. | adult | | 1 | | | | | | | | |
| Unident. | nymph | | | | | | | | | | 1 |
| Trichoptera | | | | | | | | | | | |
| Hydropsyche sp. | larva | 2 | | | | | | | | | |
| Unident. | larva | 18 | 4 | | | 2 | 2 | | 1 | 17 | |
| Unident. | pupa | | | | | | | | | 100 | |
| Unident. | adult | 10 | 1 | | | | 6 | | 1 | | |
| Diptera | | | | | | | | | | | |
| Polypedilum sp. | larva | 1 | | | | | | | | | |
| Orthocladius sp. | larva | 35 | | 1 | | | | | 14 | 87 | |
| Orthocladius sp. | pupa | 8 | | | | | | | 1 | 32 | 8 |
| Orthocladius sp. | adult | 4 | 2 | | | | | | | 8 | |
| Tanypodinae | larva | 13 | | | | | | | 1 | 3 | |
| Tanypodinae | pupa | 2 | | 12 | | | | | | 6 | |
| Tanytarsus sp. | larva | 13 | | | | | | | 3 | 15 | 12 |
| Tanytarsus sp. | pupa | 2 | | | | | | | | 11 | 10 |
| Tanytarsus sp. | adult | 1 | | | | | | | | | |
| Chironomus sp. | larva | 100 | 9 | 20 | 2 | 10 | | 8 | 40 | 51 | |
| Chironomus sp. | pupa | 9 | | 10 | | | | 1 | 10 | | 2 |
| Chironomus sp. | adult | 2 | | 10 | | 3 | | | 10 | 6 | 10 |
| Simulium sp. | larva | 22 | | | | | | | 2 | | |
| Simulium sp. | pupa | 9 | | | | | | | 10 | | |
| Simulium sp. | adult | 4 | | | | | | | 2 | 2 | |
| Ceratopogonidae | adult | 1 | | | | | | | | | |
| Unident. sp. | larva | | | 10 | | | | | | | |
| Unident. sp. | pupa | 15 | | | | | | | | | |
| Unident. sp. | adult | 36 | | 20 | 1 | | | | | | |
| Thienemanniella sp. | pupa | | | | | | | | 7 | | |
| Stempellinella sp. | pupa | | | | | | | | 1 | | |
| Copepoda | | | | | | | | | | | |
| Calanoida | | 856 | | | | | | | | | |
| Amphipoda | | | | | | | | | | | |
| Unident. | | 200 | | | | | | | | 17 | |
| Terrestrial | | | | | | | | | | | |
| Unident. | | 14 | 2 | | 2 | 3 | | | 3 | 9 | |
| Acari | | | | | | | | | 4 | 32 | |
| Ostracoda | | | | | | | | | | 59 | |
| Hemiptera | | | | | 1 | | | | | | |
| Coleoptera | | | | | 1 | | | | | | |
| Collembola | | | | | | | | | | | 3 |
| Tota. No. organisms | | 1391 | 72 | 153 | 7 | 19 | 11 | 9 | 480 | 486 | 50 |
| Total No. taxa | | 16 | 9 | 6 | 5 | 4 | 2 | 1 | | | 6 |

Appendix 20 (Cont'd.)

B. July 16 - 19

| Site | | Cutoff Cr. | Targe Cr. | Swanson Cr. | Greer Cr. | Unnamed Cr. No. 1 | Tahultzu Cr. | Tatsunai Cr. | Unnamed Cr. No. 2 | Unnamed Cr. No. 3 | Kluk Cr. | Stony Cr. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stomach fullness | | 1/2 | full | 1/2 | 3/4 | full | 3/4 | 1/2 | 3/4 | 3/4 | 3/4 | 3/4 |
| Organism | | | | | | | | | | | | |
| Ephemeroptera | | | | | | | | | | | | |
| Baetidae | nymph | | | | | 10 | | 2 | | 4 | 3 | 19 |
| Baetidae | adult | | | | | | | | | | | |
| Unident. | nymph | 5 | 25 | | 5 | | 5 | 2 | | 1 | 17 | 5 |
| | adult | 25 | 5 | 20 | 15 | | 4 | 3 | 2 | | 1 | |
| Plecoptera | nymph | | 20 | | | | | | | | | 1 |
| Trichoptera | larva | | | 5 | 39 | 19 | 15 | 1 | 1 | 6 | 6 | 10 |
| Trichoptera | adult | | | | | | | | | | | 1 |
| Diptera | | | | | | | | | | | | |
| Chironomidae | larva | 40 | 30 | | 10 | 10 | 28 | | | | | |
| Chironomidae | pupa | 30 | 20 | | 5 | 5 | | 5 | 26 | 55 | 26 | 5 |
| Chironomidae | adult | 30 | 35 | 20 | 25 | 30 | 8 | 71 | 16 | 10 | 1 | 10 |
| Ceratopogonidae | larva | | | | | 1 | | | | | 10 | 6 |
| Ceratopogonidae | pupa | | | | | | | | | | | |
| Ceratopogonidae | adult | | | | | | | | | | | |
| Simuliidae | larva | | | | 5 | 10 | 1 | | | | 1 | 65 |
| Simuliidae | pupa | | | | | | | | | | | |
| Simuliidae | adult | | | | | 1 | 5 | | | | 17 | 1 |
| Orthocladius sp. | larva | | | | | | 64 | 45 | | 96 | 92 | 1 |
| Orthocladius sp. | pupa | | | | | | 7 | 2 | | 5 | 12 | 3 |
| Orthocladius sp. | adult | | | | | | 10 | | | | | |
| Tanytarus sp. | larva | | | | | | 17 | | | 7 | | |
| Tanytarus sp. | pupa | | | | | | 15 | 1 | | 2 | | |
| Tanytarus sp. | adult | | | | | | 5 | | | | | |
| Tanypodinae | larva | | | | | | 7 | | | 4 | 6 | |
| Tanypodinae | pupa | | | | | | 5 | | | 2 | | |
| Tanypodinae | adult | | | | | | | | | 2 | | |
| Empididae | | | | | 2 | 3 | 20 | 5 | 1 | | 25 | |
| Musidae | | | | | 2 | | 10 | | 2 | | 22 | |
| Amphipoda | | 10 | | | | | | | | | | 1 |
| Coleoptera | | 4 | 1 | 2 | 6 | 2 | 22 | | 1 | 1 | | |
| Corixidae | | 1 | 5 | | 2 | | | | | | | |
| Terrestrial | | | | 3 | 26 | 15 | 191 | 33 | 20 | 35 | 106 | |
| Mullusca | | | | 1 | | | | | | | | |
| Collembola | | | | | | 1 | | | | | 4 | |
| Hymenoptera | | | | | | 1 | 4 | | | | 4 | |
| Total No. organisms | | 145 | 146 | 76 | 114 | 104 | 429 | 170 | 64 | 231 | 358 | 117 |
| Total No. taxa | | 5 | 6 | 6 | 10 | 10 | 12 | 8 | 7 | 10 | 13 | 7 |

Appendix 20 (Cont'd.)

C. July 31 - August 1

| Site | 3 | 3A | 4 | 5A | 13 | 20 | 22 |
|---|---|---|---|---|---|---|---|
| Stomach fullness | 1/2 | 3/4 | 3/4 | 3/4 | 1/2 | 3/4 | 1/3 |
| Organism | | | | | | | |
| Unident. adult | 3 | 3 | 3 | | 6 | 2 | |
| Baetidae | 2 | | | | | | |
| Trichoptera | | | | | | | |
| Unident. adult | 1 | | | | 1 | | |
| Diptera | | | | | | | |
| Chironomidae adult | | 3 | 9 | | 48 | | 18 |
| Chironomidae pupa | 7 | | | 5 | 98 | 12 | 5 |
| *Diplocladius* sp. | | | | | 2 | | 1 |
| *Microspectra* sp. | | | | 1 | 3 | 1 | |
| *Polypedilum* sp. | 1 | | | | 2 | | |
| *Cardiocladius* sp. | 1 | | | | | | |
| Muscidae adult | | | | 1 | 4 | | |
| Tabanidae | 1 | | | | 2 | | |
| *Alabesmyia* sp. | | | | | 12 | | |
| *Procladius* sp. | | | | | 9 | | |
| *Heterotris-socladius* sp. | | | | | 2 | | |
| Coleoptera | | | | | | | |
| Unident. larva | | | | | 1 | | |
| Oligochaeta | | | | | | | |
| Unident. | | | | | 3 | | |
| Hymenoptera | | | | | | | |
| Unident. adult | | 1 | 1 | | 3 | | 1 |
| Formicidae | | 1 | | | 2 | | |
| Hemiptera | | | | | | | |
| Unident. | | | 2 | | 4 | | |
| Cicadellidae | | | | 1 | 6 | | |
| *Trichocoriza* sp. | | | | | 1 | | |
| Lepidoptera | | | | | | | |
| Unident. larva | | | | | 3 | | |
| Total No. organisms | 16 | 8 | 15 | 8 | 212 | 15 | 25 |
| Total No. taxa | 7 | 4 | 4 | 4 | 19 | 3 | 3 |

Appendix 20 (Cont'd.)

D. August 10 - 13

| Site | 3 | 13 |
|---|---|---|
| Stomach fullness | 3/4 | 1/2 |
| Organism | | |
| Ephemeroptera | | |
| Unident. adult | 13 | 3 |
| Baetidae | | 1 |
| Plecoptera | 2 | 3 |
| Trichoptera adult | 1 | 2 |
| Diptera | | |
| Chironomidae adult | 3 | 1 |
| Chironomidae pupa | 164 | 372 |
| Muscidae adult | 1 | |
| Coleoptera adult | | 2 |
| Hymenoptera adult | | 1 |
| Hemiptera | 5 | 7 |
| Arachnida | 6 | 4 |
| Cladocera | | |
| *Simocephalus* sp. | | 3 |
| Calanoida | | 32 |
| Total No. organisms | 195 | 431 |
| Total No. taxa | 7 | 11 |

E. August 20 - 21

| Site | Twin Cr. | Cutoff Cr. | Swanson Cr. | Greer Cr. |
|---|---|---|---|---|
| Stomach fullness | 1/2 | 3/4 | 1/2 | 1/3 |
| Organism | | | | |
| Ephemeroptera adult | | 1 | 14 | 2 |
| Baetidae | 1 | 1 | 3 | |
| *Ephemerella* sp. | | | 1 | |
| *Siphlonurus* sp. | | | 1 | |
| *Centroptilum* sp. | | 1 | | |
| Trichoptera adult | | | 4 | |
| Diptera | | | | |
| Chironomidae adult | 4 | 1 | | 1 |
| pupa | 41 | 1 | 33 | 75 |

Appendix 20 (Cont'd.)

E. August 20 - 21 (cont'd)

| Site | Twin Cr. | Cutoff Cr. | Swanson Cr. | Greer Cr. |
|---|---|---|---|---|
| *Procladius* sp. | 2 | 1 | | |
| *Heterotrissocladius* sp. | 2 | | 1 | |
| *Diplocladius* sp. | 8 | | | |
| *Sittia* sp. | 3 | | | |
| *Cricotopus* sp. | 7 | | 3 | |
| *Microspectra* sp. | 4 | | 1 | |
| Simuliidae | 1 | | 2 | |
| Muscidae | | 1 | | |
| Tipulidae | | 1 | | |
| *Cardiocladius* sp. | | | 1 | |
| *Polypedilum* sp. | | | | |
| Coleoptera adult | | 2 | 1 | |
| Hymenoptera adult | 4 | 2 | 2 | 1 |
| Formicidae | | 1 | 4 | |
| Hemiptera | | | | |
| Corixidae | | 4 | 1 | |
| Cicadellidae | | | 2 | 1 |
| Unident. | | | 1 | |
| Arachnida | 1 | | 1 | |
| Acari | 3 | | 3 | |
| Ostracoda | | 1 | | |
| Mollusca | | 2 | | |
| Collembola | | 1 | | |
| Lepidoptera | | 1 | | |
| Amphipoda | | | | |
| *Gammarus* sp. | | 37 | | |
| *Hyalella* sp. | | 6 | | |
| Total No. organisms | 81 | 62 | 81 | 81 |
| Total No. taxa | 12 | 15 | 20 | 5 |

Appendix 20 (Cont'd.)

F. October 6 - 7

| Site | Cutoff Cr. | Greer Cr. | Tahultzu Cr. | Tatsunai Cr. | Unnamed Cr. No. 2 | Kluk Cr. |
|---|---|---|---|---|---|---|
| Stomach fullness | 3/4 | 1/4 | 1/3 | 1/2 | 1/2 | 3/4 |
| Organism | | | | | | |
| Ephemeroptera adult | | | | | | 2 |
| Baetidae | | | 1 | | | |
| Siphlonurus sp. | | | 1 | | | |
| Cinygmula sp. | | 2 | | | | |
| Ephemerella sp. | | | | | | 1 |
| Trichoptera | | 1 | | 1 | 5 | |
| Plecoptera adult | 2 | | 2 | | 6 | 3 |
| Nemoura sp. | | | | | | 2 |
| Diptera | | | | | | |
| Chironomidae adult | 6 | 1 | 19 | 12 | 10 | 36 |
| Chironomidae pupa | | | 14 | 12 | 2 | |
| Procladius sp. | | | 1 | | | |
| Heterotrissocladius sp. | | | 11 | | | 3 |
| Cricotopus sp. | | | 3 | | | 4 |
| Microspectra sp. | | | 4 | | | 1 |
| Psychodidae | | | 3 | | | |
| Musicidae adult | | | 3 | | | |
| Simuliidae | | | 1 | | | |
| Tabanidae | | | 1 | | | |
| Dixidae | | | | | 1 | |
| Smittia sp. | | | | | | 1 |
| Microspectra sp. | | | | | | |
| Polypedilum sp. | | | | | | 3 |
| Tipulidae | | | | | | 1 |
| Ceratopogonidae | | | | | | 1 |
| Coleoptera adult | | | 8 | 1 | 1 | 9 |
| Coleoptera larva | | | | | 2 | 2 |
| Hymenoptera adult | 1 | 2 | 14 | 3 | 14 | 39 |
| Formicidae | | 2 | 2 | | 2 | 3 |
| Hemiptera | | 1 | 1 | 1 | 3 | 33 |
| Aphidadae | | 2 | | | | 1 |
| Corixidae | 2 | 2 | | | | 2 |
| Cicadellidae | | | | | 2 | 4 |
| Collembola | 1 | | 2 | | 3 | 11 |
| Mollusca | | | | | | 1 |
| Lepidoptera larva | | | 2 | | 2 | 1 |
| Oligochaeta | | | | | 1 | 1 |
| Amphipoda | | | | | | |
| Gammarus sp. | 14 | | | | | |
| Hyalella sp. | 5 | | | | | |
| Arachnida | | | 3 | | 2 | |
| Total No. organisms | 31 | 13 | 96 | 30 | 56 | 165 |
| Total No. taxa | 7 | 8 | 19 | 5 | 14 | 24 |

G. November 25 (1 fish; site No. 3)

| | |
|---|---|
| Stomach fullness | 1/4 |
| Organism | |
| Copepoda | |
| Calanoida | 16 |

Appendix 21. Number and percent frequency occurrence of each food type in stomachs of chinook juveniles sampled in Nechako River at sites No. 3 and No. 11, April - October 1981, and mean prey length (L); sampling date and total fish examined (n) are shown in top left corner.[a]

SITE No. 3

| | Taxa | Larvae | | Pupae | | Nymphs | | Adults | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % | No. | % | No. | % |
| April 27 | Diptera | 7 | 2.2 (0.3) | 194 | 59.9 (8.4) | 0 | | 114 | 35.2 (4.8) | 315 | 97.2 |
| (n=30) | Ephemeroptera | 0 | | 0 | | 3 | 0.9 (0.1) | 4 | 1.2 (0.2) | 7 | 2.2 |
| | Coleoptera | 0 | | 0 | | 0 | | 0 | | 0 | |
| | Hemiptera | 0 | | 0 | | 0 | | 0 | | 0 | |
| | Trichoptera | 0 | | 0 | | 0 | | 0 | | 0 | |
| | Other | 0 | | 0 | | 0 | | 2 | 0.6 (0.1) | 2 | 0.6 |
| | Total | - | | - | | - | | - | | 324 | 100 |
| | L (mm) | 3.0 | | 2.2 | | 5.0 | | 2.7 | | - | |
| June 7 | Diptera | 5 | 41.7 (0.2) | 1 | 8.3 ( 0) | 0 | | 0 | | 6 | 50.0 |
| (n=6) | Ephemeroptera | 0 | | 0 | | 1 | 8.3 ( 0) | 0 | | 1 | |
| | Coleoptera | 0 | | 0 | | 0 | | 0 | | 0 | 8.3 |
| | Hemiptera | 0 | | 0 | | 0 | | 0 | | 0 | |
| | Trichoptera | 0 | | 5 | 41.7 (0.2) | 0 | | 0 | | 5 | 41.7 |
| | Other | 0 | | 0 | | 0 | | 0 | | 0 | |
| | Total | - | | - | | - | | - | | 11 | 100 |
| | L (mm) | 3.3 | | 4.5 | | 7.0 | | 0 | | - | |
| July 20 | Diptera | 22 | 5.2 (1.0) | 7 | 1.6 (0.3) | 0 | | 118 | 27.6 (5.1) | 147 | 34.4 |
| (n=29) | Ephemeroptera | 0 | | 0 | | 87 | 20.4 (3.8) | 45 | 10.8 (2.0) | 133 | 31.2 |
| | Coleoptera | 45 | 10.5 (1.9) | 0 | | 0 | | 1 | 0.2 ( 0) | 46 | 10.8 |
| | Hemiptera | 0 | | 0 | | 48 | 11.2 (2.1) | 4 | 0.9 (0.2) | 52 | 12.2 |
| | Trichoptera | 18 | 4.2 (0.8) | 6 | 1.4 (0.3) | 0 | | 6 | 1.4 (0.3) | 30 | 7.0 |
| | Other | 0 | | 0 | | 2 | 0.5 (0.1) | 17 | 4.0 (0.7) | 19 | 4.5 |
| | Total | - | | - | | - | | - | | 427 | 100 |
| | L (mm) | 6.0 | | 3.4 | | 4.1 | | 3.7 | | - | |
| Sept. 29 | Diptera | 2 | 0.4 (0.1) | 90 | 18.4 (3.9) | 0 | | 137 | 28.0 (5.9) | 229 | 46.8 |
| (n=31) | Ephemeroptera | 0 | | 0 | | 3 | | 163 | 33.3 (7.0) | 166 | 34.0 |
| | Coleoptera | 1 | 0.2 ( 0) | 0 | | 0 | | 3 | 0.6 (0.1) | 4 | 0.8 |
| | Hemiptera | 0 | | 0 | | 18 | 3.7 (0.8) | 9 | 1.8 (0.4) | 27 | 5.5 |
| | Trichoptera | 16 | 3.3 (0.7) | 1 | 0.2 ( 0) | 0 | | 5 | 1.0 (0.2) | 22 | 4.5 |
| | Other | 0 | | 0 | | 1 | 0.2 ( 0) | 40 | 8.2 (1.7) | 41 | 8.4 |
| | Total | - | | - | | - | | - | | 489 | 100 |
| | L (mm) | 6.6 | | 2.7 | | 3.2 | | 3.9 | | - | |

Appendix 21 (Cont'd.)

SITE No. 11

| | Taxa | Larvae | | Pupae | | Nymphs | | Adults | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % | No. | % | No. | % |
| April 28 | Diptera | 216 | 57.8 (9.3) | 149 | 39.8 (6.4) | 0 | | 7 | 1.9 (0.3) | 372 | 99.5 |
| (n=29) | Ephemeroptera | 0 | | 0 | | 1 | 0.3 ( 0) | 0 | | 1 | 0.3 |
| | Coleoptera | 0 | | 0 | | 0 | | 1 | 0.3 ( 0) | 1 | 0.3 |
| | Hemiptera | 0 | | 0 | | 0 | | 0 | | 0 | |
| | Trichoptera | 0 | | 0 | | 0 | | 0 | | 0 | |
| | Other | 0 | | 0 | | 0 | | 0 | | 0 | |
| | Total | – | | – | | – | | – | | 374 | 100 |
| | L (mm) | 2.3 | | 3.3 | | 0 | | 3.8 | | – | |
| June 5 | Diptera | 50 | 9.0 (2.2) | 369 | 66.4 (16.0) | 0 | | 65 | 11.7 (2.8) | 484 | 87.1 |
| (n=31) | Ephemeroptera | 0 | | 0 | | 3 | 0.5 (0.1) | 7 | 1.3 (0.3) | 10 | 1.8 |
| | Coleoptera | 2 | 0.4 (0.1) | 0 | | 0 | | 0 | | 2 | 0.4 |
| | Hemiptera | 0 | | 0 | | 0 | | 2 | 0.4 (0.1) | 2 | 0.4 |
| | Trichoptera | 1 | 0.2 ( 0) | 0 | | 0 | | 1 | 0.2 ( 0) | 2 | 0.4 |
| | Other | 0 | | 0 | | 2 | 0.4 (0.1) | 54 | 9.7 (2.3) | 56 | 10.1 |
| | Total | – | | – | | – | | – | | 556 | 100 |
| | L (mm) | 4.0 | | 2.4 | | 1.8 | | 2.5 | | – | |
| July 22 | Diptera | 4 | 3.2 (0.2) | 20 | 15.9 (0.9) | 0 | | 42 | 33.3 (1.8) | 66 | 52.4 |
| (n=9) | Ephemeroptera | 0 | | 0 | | 10 | 7.9 (0.4) | 8 | 6.4 (0.4) | 18 | 14.3 |
| | Coleoptera | 30 | 23.8 (1.3) | 0 | | 0 | | 0 | | 30 | 23.8 |
| | Hemiptera | 0 | | 0 | | 0 | | 0 | | 0 | |
| | Trichoptera | 6 | 4.8 (0.3) | 0 | | 0 | | 1 | 0.8 ( 0) | 7 | 5.6 |
| | Other | 0 | | 0 | | 2 | | 3 | 2.4 (0.1) | 5 | 4.0 |
| | Total | – | | – | | – | | – | | 126 | 100 |
| | L (mm) | 4.8 | | 2.6 | | 3.4 | | 3.6 | | – | |
| Oct. 1 | Diptera | 0 | | 0 | | 0 | | 1 | 16.7 ( 0) | 1 | 16.7 |
| (n=1) | Ephemeroptera | 0 | | 0 | | 0 | | 0 | | 0 | |
| | Coleoptera | 0 | | 0 | | 0 | | 0 | | 0 | |
| | Hemiptera | 0 | | 0 | | 0 | | 0 | | 0 | |
| | Trichoptera | 5 | 83.3 (0.2) | 0 | | 0 | | 0 | | 0 | |
| | Other | 0 | | 0 | | 0 | | 0 | | 5 | 83.3 |
| | Total | – | | – | | – | | – | | 6 | |
| | L (mm) | 0 | | 0 | | 0 | | 5.0 | | – | |

[a] Percent frequency occurrence was calculated separately for each sampling date and site and for the total period for both sites (in parenthesis).

Appendix 22. Mean length and weight of chinook juveniles sampled for stomach contents, fish condition factor (K), and water temperature at sites No. 3 and No. 11, Nechako River, April - October 1981 (n gives sample size).

| Date | SITE No. 3 | | | | | SITE No. 11 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Fish | | | | Temp. | Fish | | | | Temp. |
| | n | Length (mm) | Weight (g) | K | (°C) | n | Length (mm) | Weight (g) | K | (°C) |
| Apr. 27 | 30 | 35 | 0.38 | 0.89 | 4.0 | - | - | - | - | |
| Apr. 28 | - | - | - | - | | 29 | 37 | 0.45 | 0.92 | 8.0 |
| June 5 | - | - | - | - | | 31 | 43 | 0.65 | 0.81 | 14.0 |
| June 7 | 6 | 45 | 0.60 | 0.65 | 14.0 | - | - | - | - | |
| July 20 | 29 | 67 | 2.29 | 0.76 | 20.0 | - | - | - | - | |
| July 22 | - | - | - | - | | 9 | 67 | 2.54 | 0.84 | 20.0 |
| Sept. 29 | 31 | 96 | 8.99 | 1.02 | 9.0 | - | - | - | - | 10.0 |
| Oct. 1 | - | - | - | - | | 1 | 82 | 4.66 | 0.85 | 10.0 |

Appendix 23. Number of organisms per $m^2$ in Nechako benthos by site, June - November 1980.[a]

A. June 24-28, 1980

| Site | 1 | 3 | 3A | 4 | 5 | 5A | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TAXA | | | | | | | | | | | | | |
| Ephemeroptera | | | | | | | | | | | | | |
| Baetidae | 44 | 28 | 41 | 44 | 301 | 77 | 60 | 20 | 8 | 8 | 33 | 44 | 154 |
| Ephemerellidae | 78 | 58 | 16 | 16 | 6 | 1 | 2 | 1 | 45 | 5 | 13 | | |
| Heptageniidae | 1 | 7 | 9 | 16 | 37 | 12 | 33 | 10 | 18 | 38 | 68 | 74 | |
| Leptophlebiidae | | | | | | 11 | | | | | | | |
| Siphlonuridae | | | | | | | | | | | | | 7 |
| Plecoptera | | | | | | | | | | | | | |
| Chloroperlidae | 2 | 3 | | 39 | | | 5 | 1 | 1 | 11 | 8 | 7 | |
| Perlidae | | | | 5 | | | | | | 7 | 1 | | |
| Unident. | | 8 | 4 | 22 | | 11 | | | 18 | 37 | 15 | 22 | |
| Trichoptera | | | | | | | | | | | | | |
| Hydropsychidae | 1 | 1 | | 7 | | | | 1 | 5 | 5 | 8 | 8 | |
| Glossomatidae | | | | | | | 1 | | 4 | | | | |
| Limnephilidae | | 1 | | | | | 1 | | | | 7 | | |
| Unident. | | | | 4 | | | | | 1 | 2 | 1 | | |
| Diptera | | | | | | | | | | | | | |
| Chironomidae | 1,144 | 146 | 286 | 165 | 19 | 915 | 33 | 88 | 207 | 159 | 190 | 106 | 132 |
| Ceratopogonidae | 2 | 17 | | 33 | 29 | | | 2 | | 22 | | 22 | |
| Dolichopodidae | 2 | | | | | | | | | | | | |
| Simuliidae | | 1 | 4 | | 18 | | 117 | 10 | 11 | 70 | 48 | 81 | |
| Tipulidae | | | | 8 | 2 | | | | | | | | |
| Unident. | | 15 | 37 | 11 | | 33 | 2 | | 7 | 29 | 33 | 7 | |
| Odonata | | | | | | | | 1 | | | | | |
| Coleoptera | | | 4 | 4 | | | | | | | 4 | | |
| Oligochaeta | | 1 | 7 | | | 11 | | 6 | 7 | 7 | | 2 | 110 |
| Nematoda | | 4 | 4 | | | | | 1 | | | | | |
| Hydracarina | | 26 | 11 | 77 | 7 | 22 | 7 | 2 | 44 | 29 | 22 | 55 | 220 |
| Copepoda | | | 7 | | | 2 | 2 | 5 | | | | | 2,266 |
| Cladocera | | | 22 | | | 23 | 1 | 97 | | | | 8 | 2,772 |
| Ostracoda | | | | 44 | | | | 2 | | | 11 | | 242 |
| Gastropoda | | | | | | | | | 1 | | | | |
| Pelecypoda | 11 | | | 4 | | | | | | | | | 1 |
| Hydrozoa | | | 7 | 4 | 4 | | | | | | | | |
| Amphipoda | | | | | | | | | | | | | 7 |
| Hemiptera | | | | | | | | 1 | | | | | 3 |
| Total No. organisms | 1,285 | 316 | 459 | 503 | 423 | 1,118 | 275 | 248 | 377 | 429 | 462 | 436 | 5,914 |
| Total No. taxa | 9 | 14 | 14 | 17 | 9 | 11 | 12 | 16 | 14 | 14 | 15 | 12 | 11 |

Appendix 23 (Cont'd.)

A. June 24-28, 1980 (Cont'd.)

| Site | 13 | 14 | 15 | 16 | 17 | 22 | 23 | Cutoff Cr. | Swanson Cr. | Greer Cr. | Tahultzu Cr. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TAXA | | | | | | | | | | | |
| Ephemeroptera | | | | | | | | | | | |
| Baetidae | | 24 | 1 | | | 66 | 7 | 8 | 272 | 93 | 21 |
| Ephemerellidae | | 10 | 9 | 47 | 104 | | 2 | 7 | 137 | 5 | 4 |
| Ephemeridae | | | | | | 1 | | | | | |
| Heptageniidae | | 16 | 17 | 91 | 28 | 15 | 67 | | 26 | 9 | 7 |
| Leptophlebiidae | | | | | | 11 | | 7 | 44 | 1 | 1 |
| Siphlonuridae | | | | | | 7 | | | 5 | | |
| Tricorythidae | | | 4 | 44 | 44 | | 24 | | | | |
| Plecoptera | | | | | | | | | | | |
| Chloroperlidae | | 13 | | 2 | | 18 | 9 | 7 | 121 | 51 | 3 |
| Perlidae | | | | | | | 1 | | | 1 | 1 |
| Unident. | 7 | 7 | 1 | 22 | | 4 | 22 | 7 | 103 | 39 | 2 |
| Trichoptera | | | | | | | | | | | |
| Hydropsychidae | | 12 | 3 | 30 | 66 | 5 | 8 | | | 6 | 3 |
| Hydroptilidae | | | | 22 | | | | | | | |
| Glossosomatidae | | 8 | | | | | | | | | |
| Limnephilidae | | | | | | | | 15 | 2 | 5 | |
| Rhyacophilidae | | | | | | | | 7 | | | |
| Unident. | | 2 | | 3 | | | | | | | |
| Diptera | | | | | | | | | | | |
| Chironomidae | 519 | 622 | 273 | 1,606 | 1,396 | 201 | 524 | 396 | 1,345 | 254 | 39 |
| Ceratopogonidae | 7 | | | | 22 | 7 | 29 | | 44 | | |
| Dolichopodidae | | 1 | | | | | | | 1 | | |
| Simuliidae | | 14 | | 66 | 22 | 4 | | 65 | | | |
| Tipulidae | | | | | | | | 7 | 8 | 2 | 1 |
| Unident. | 7 | 59 | 15 | | 22 | 62 | 29 | | 73 | 39 | 3 |
| Odonata | | | | | | 1 | | 15 | | | |
| Coleoptera | 7 | | | | | | | 7 | 15 | | 3 |
| Oligochaeta | 7 | | 11 | | 110 | 77 | 37 | 88 | | | 4 |
| Nematoda | 7 | | | 22 | | 7 | | 29 | | 5 | 1 |
| Hydracarina | 7 | 73 | 37 | 110 | 66 | 22 | 37 | 7 | | 24 | 3 |
| Copepoda | 29 | 7 | 4 | 44 | 176 | 7 | 15 | 201 | | 5 | 1 |
| Cladocera | | 22 | 1 | | 132 | 4 | 14 | | | | 5 |
| Ostracoda | | | | | | 4 | 7 | | | | |
| Gastropoda | | | | 22 | 22 | | | | | | |
| Pelecypoda | | | | | | | | 7 | | | |
| Hydrozoa | 125 | 59 | 11 | | | | | | | | |
| Amphipoda | | | | | | | | 24 | | | |
| Hemiptera | | | | | | | 7 | | | | |
| Total No. organisms | 722 | 949 | 387 | 2,131 | 2,210 | 522 | 839 | 904 | 2,196 | 539 | 102 |
| Total No. taxa | 10 | 16 | 13 | 14 | 13 | 19 | 17 | 18 | 14 | 15 | 17 |

Appendix 23 (Cont'd.)

B. July 16-18, 1980

| Site | | 1 | 3 | 5A | 21 | 24 | 11 |
|---|---|---|---|---|---|---|---|
| TAXA | | | | | | | |
| Ephemeroptera | | | | | | | |
| Heptageniidae | nymph | 5 | 2 | 2 | 1 | | 19 |
| Baetidae | nymph | 23 | | 10 | 7 | 3 | 12 |
| Ephemerellidae | nymph | 29 | 1 | | 6 | 3 | 1 |
| Tricorythidae | nymph | | | 2 | 2 | 2 | 2 |
| Leptophlebiidae | nymph | | | | | | 2 |
| Plecoptera | nymph | 17 | 2 | | 6 | 1 | 3 |
| Trichoptera | pupae | 2 | | | | | 2 |
| Hydropsychidae | larvae | 1 | | 2 | 3 | 8 | 6 |
| Hydroptilidae | larvae | | 1 | | | | |
| Diptera | | | | | | | |
| Chironomidae | larvae | 182 | 65 | 58 | 114 | 57 | 327 |
| Chironomidae | pupae | 2 | 2 | 4 | 2 | 5 | 9 |
| Chironomidae | emerging adults | 1 | | | | | |
| Ceratopogonidae | larvae | 1 | 4 | 2 | 1 | | 2 |
| Ceratopogonidae | pupae | | | 1 | | | |
| Simuliidae | larvae | 3 | | 121 | 2 | | 19 |
| Simuliidae | pupae | | | 2 | | | |
| Dolichopodidae | larvae | | | 1 | | | |
| Tipulidae | larvae | | | | | 1 | |
| Hemiptera | | 1 | | 1 | | | |
| Coleoptera | larvae | 4 | | 1 | | | 2 |
| Coleoptera | adults | | | | | 2 | |
| Oligochaeta | | 6 | 3 | 17 | 6 | 1 | 39 |
| Nematoda | | | 2 | | | | 3 |
| Hydracarina | | | | 1 | | 1 | 1 |
| Copepoda | | 104 | 4 | 1 | | | |
| Cladocera | | | | 1 | | | 1 |
| Gastropoda | | 1 | | | 2 | | 3 |
| Pelecypoda | juveniles | | | | | | 10 |
| Hydrozoa | | | | | 1 | 1 | 8 |
| Cyprinidae | juveniles | | | | | | 1 |
| Terrestrial Insecta | | | 6 | | 1 | | |
| Total No. organisms | | 382 | 92 | 227 | 154 | 85 | 472 |
| Total No. taxa | | 14 | 10 | 14 | 13 | 11 | 20 |

Appendix 23 (Cont'd.)

B. July 16-18, 1980 (Cont'd.)

| Site | | Unnamed No. 1 Cr. | Unnamed No. 2 Cr. | Cutoff Cr. | Cutoff Cr. | Tebuktuk Cr. | Swanson Cr. | Target Cr. | Glover Cr. | Tatsamenie Cr. |
|---|---|---|---|---|---|---|---|---|---|---|
| TAXA | | 17 July 1630 | 17 July 1945 | 16 July | 17 July | | | | | |
| Ephemeroptera | | | | | | | | | | |
| Heptageniidae | nymph | 9 | 2 | 10 | | 8 | 33 | 696 | 15 | |
| Baetidae | nymph | 91 | 40 | 12 | 3 | 88 | 98 | 6 | 172 | 22 |
| Ephemerellidae | nymph | 1 | 1 | 25 | 1 | | 41 | 25 | | 10 |
| Leptophlebiidae | nymph | | 17 | 1 | 12 | | 17 | 148 | 4 | 17 |
| Siphlonuridae | nymph | | 2 | | | | 26 | | | 8 |
| Tricorythidae | nymph | | 40 | | | | | | | 1 |
| Plecoptera | | | | | | | | | | |
| Nemouridae | nymph | 3 | 125 | | | 28 | 64 | 16 | 26 | 60 |
| Chloroperlidae | nymph | 5 | 1 | | | | 5 | 41 | 17 | 1 |
| Perlodidae | nymph | | 1 | | 2 | | 13 | 16 | 2 | 24 |
| Perlidae | nymph | | | | | 17 | | 3 | | |
| Filipalpia | im.nymph | 1 | 64 | | 1 | 94 | 8 | 24 | 2 | 72 |
| Trichoptera | | | | | | | | | | |
| Limnephilidae | larvae | 1 | | | | 5 | 6 | 3 | | |
| Rhyacophilidae | larvae | 1 | | | | | | | | 1 |
| Hydropsychidae | larvae | | | 3 | 1 | 16 | | | 7 | |
| Hydroptilidae | larvae | | | 8 | | | | | | |
| Glossosomatidae | larvae | | | | | | 15 | | 2 | |
| Lepidostomatidae | larvae | | | | | | | 2 | | |
| Brachycentridae | larvae | | | | | | | | 1 | |
| Coleoptera | | | | | | | | | | |
| Elmidae | larvae | 106 | 8 | | | 36 | | 66 | | 6 |
| Elmidae | adult | 4 | | | | | | 1 | | 1 |
| Dytiscidae | larvae | | | 8 | | | | | | |
| Haliplidae | larvae | | | 4 | | 24 | | | | 16 |
| Hydrophilidae | larvae | | | | | | 4 | | | |
| Diptera | | | | | | | | | | |
| Chironomidae | larvae | 45 | 129 | 746 | 29 | 1,119 | 192 | 265 | 147 | 2,535 |
| Chironomidae | pupae | | 8 | 8 | | 9 | 8 | | 8 | 56 |
| Tipulidae | larvae | 2 | | 1 | 2 | 73 | 2 | 25 | | 21 |
| Simuliidae | larvae | 8 | | | 10 | 9 | 8 | 16 | 60 | |
| Simuliidae | pupae | | | | | | | | 2 | |
| Ceratopogonidae | larvae | 2 | | 4 | | | 4 | | 2 | 2 |
| Ceratopogonidae | pupae | | | | | | 16 | | | |
| Empididae | larvae | | 8 | | | 7 | | | | 8 |
| Empididae | pupae | | | | | | | | 2 | |
| Psychodidae | larvae | | 8 | | | 17 | | | | 16 |

Appendix 23 (Cont'd.)

B. July 16-18, 1980 (Cont'd.)

| Site | | Unnamed No. 1 Cr. | Unnamed No. 2 Cr. | Cutoff Cr. | Cutoff Cr. | Tahultzu Cr. | Swanson Cr. | Targe Cr. | Greer Cr. | Tatsunai Cr. |
|---|---|---|---|---|---|---|---|---|---|---|
| TAXA | | 17 July 1630 | 17 July 1945 | 16 July | 17 July | | | | | |
| Tabanidae | larvae | | | 4 | | 1 | | | | |
| Muscidae | larvae | | | | | 2 | | | | |
| Dixidae | larvae | | | | | | | | 2 | |
| Oligochaeta | | | | | | | | | | |
| Lumbriculidae | adult | | 1 | 5 | | | | | | |
| Lumbricidae | adult | 1 | | | | | | | | |
| Naididae | adult | | 200 | 48 | | | | 56 | | |
| Tubificidae | adult | | | 6 | 7 | | 46 | | | |
| Oligochaeta | immature | | | 36 | | 1 | | | | |
| Cnidaria | | | | | | | | | | |
| Hydridae | buds | | 8 | 4 | | 16 | | | | |
| Gastropoda | immature | | 8 | 4 | 5 | | | | | 1 |
| Pelecypoda | immature | | | 8 | 1 | | | | | |
| Copepoda | | | | | | | | | | |
| Calanoida | | | | 4 | | | | | | |
| Cyclopoida | | | 16 | | 1 | 8 | | | 2 | 8 |
| Harpacticoida | | | 8 | | | 8 | | | | |
| Hemiptera | | | | | | | | | | |
| Corixidae | nymph | | | 10 | | | | | | |
| Hirudinea | | | | | | | | | | |
| Erpobdellidae | im.adult | | | 36 | 1 | | | | | |
| Ostracoda | | | 8 | | 1 | 8 | | | | 11 |
| Hydracarina | | | | | 2 | 20 | | 17 | 2 | 102 |
| Amphipoda | | | | | | | | | | |
| Talitridae | adult | | | | 2 | | | | | |
| Gammaridae | adult | | | | 12 | | | | | |
| Nematoda | | | | | 4 | | 4 | | | 10 |
| Collembola | adult | | | | | | | | | 1 |
| Pisces | | | | | | | | | | |
| Cyprinidae | immature | | | | | | | | 56 | 2 |
| Arachnida | adult | | | | | | 4 | | | |
| Terrestrial Insecta | | 3 | | | | | | | | |
| Fish Eggs | | | 8 | | | | | | | |
| Total No. organisms | | 283 | 708 | 995 | 97 | 1,654 | 614 | 1,426 | 531 | 3,012 |
| Total No. taxa | | 15 | 22 | 22 | 19 | 22 | 19 | 17 | 18 | 24 |

Appendix 23 (Cont'd.)

C. August 8-20, 1980

| TAXA | | Site 3 (Aug. 8) | 3A (Aug. 10) | 5A (Aug. 10) | 2 (Aug. 10) | 11 (Aug. 12) | 21 (Aug. 13) | Cutoff Cr. (Aug. 20) |
|---|---|---|---|---|---|---|---|---|
| Ephemeroptera | subimago | 2 | | | | | | |
| Heptageniidae | nymph | | | 1 | | | | |
| Baetidae | nymph | 6 | 13 | 1 | 6 | 11 | 4 | 8 |
| Ephemerellidae | nymph | 8 | | 1 | | | | |
| Leptophlebiidae | nymph | | | 2 | | | | 1 |
| Plecoptera | | | | | | | | |
| Chloroperlidae | nymph | 4 | | | | | | |
| Perlodidae | nymph | | | 2 | | | | 1 |
| Trichoptera | | | | | | | | |
| Lepidostomatidae | larvae | | | 2 | | | | |
| Hydroptilidae | larvae | | | | | | | 5 |
| Coleoptera indeterminate | larvae | | | | 4 | | | |
| Chrysomelidae | larvae | 2 | | | | 1 | | |
| Chrysomelidae | adult | | | | | 1 | | |
| Dytiscidae | larvae | 2 | | 2 | | 2 | 1 | |
| Dytiscidae | adult | | | | 1 | | 1 | |
| Hydrophilidae | larvae | 2 | | | | | | |
| Haliplidae | larvae | 4 | | | | | | |
| Elmidae | larvae | | | 1 | | | | |
| Elmidae | adult | | | | | | | 1 |
| Psephenidae | larvae | 2 | | | | | | |
| Diptera | | | | | | | | |
| Chironomidae | larvae | 143 | 25 | 29 | 5 | 5 | 8 | |
| Chironomidae | pupae | 22 | | 1 | | | 6 | |
| Chironomidae | em.adults | | | | | | 3 | |
| Ceratopogonidae | larvae | | | | | | 1 | |
| Empididae | larvae | | | 1 | | | | |
| Dolichopodidae | larvae | | | | | | 6 | |
| Tipulidae | larvae | | | 1 | | | | |
| Tabanidae | larvae | 2 | | | | | | |
| Oligochaeta | | | | | | | | |
| Lumbriculidae | adult | | 6 | | | | | |
| Tubificidae | adult | | | | | | | 2 |
| Naididae | adult | 5 | 70 | 10 | 1 | | 11 | 5 |
| Oligochaeta | immature | | 8 | 5 | 14 | | 1 | |
| Gastropoda | immature | 4 | 2 | | | | 2 | |
| Pelecypoda | immature | 2 | | | | | | |
| Copepoda | | | | | | | | |
| Calanoida | | 274 | 120 | 29 | 155 | 82 | 37 | |
| Cyclopoida | | 20 | 4 | | 6 | 15 | 3 | 1 |
| Hemiptera | | | | | | | | |
| Corixidae | nymph & adult | 2 | 18 | | 3 | | 6 | |

Appendix 23 (Cont'd.)

C. August 8-20, 1980 (Cont'd.)

| Site / TAXA | | 3 (Aug. 8) | 3A (Aug. 10) | 5A (Aug. 10) | 2 (Aug. 10) | 11 (Aug. 12) | 21 (Aug. 13) | Cutoff Cr. (Aug. 20) |
|---|---|---|---|---|---|---|---|---|
| Cladocera | | 2 | 6 | | | 5 | 17 | 1 |
| Ostracoda | | 6 | | | | | 1 | |
| Hydracarina | | | | | | | 2 | 3 |
| Amphipoda | | | | | | | | |
| Talitridae | adult | | | | | | 1 | 2 |
| Gammaridae | adult | | | | | | | 12 |
| Nematoda | | 2 | | | | | | |
| Homoptera | | 2 | | 1 | 1 | 1 | | |
| Arachnida | adult | | | | 2 | | | |
| Collembola | adult | | | | 2 | | | |
| Terrestrial Insecta | | 10 | | | | | | |
| Total No. organisms | | 528 | 272 | 89 | 200 | 123 | 111 | 42 |
| Total No. taxa | | 22 | 10 | 15 | 12 | 8 | 15 | 12 |

D. November 27, 1980

| Site / TAXA | 21 | 2 | 5A | 3A (i) | 3A (ii) | 3A (iii) | 3A (iv) |
|---|---|---|---|---|---|---|---|
| Ephemeroptera | | | | | | | |
| *Ephemerella levis* | | 19 | 18 | 2 | 3 | 1 | 58 |
| *Baetis* sp. | | 12 | 12 | 1 | 3 | 4 | 60 |
| *Siphlonourus* sp. | | 1 | 2 | | | | |
| *Cinygmula* sp. | | | 3 | | 1 | | 1 |
| *Rithrogena* sp. | | | | | | | 2 |
| Plecoptera | | | | | | | |
| *Alloperia* sp. | 2 | 21 | 33 | 3 | 12 | 3 | 13 |
| *Capnia* sp. | | 2 | 6 | | 1 | | 5 |
| *Isogenoides (frontalis?)* | | | 1 | | 1 | | |
| *Isoperla* sp. | | | | | | | 1 |
| Trichoptera | | | | | | | |
| *Cheumatopsyche* sp. | 2 | 27 | 10 | 2 | 11 | 2 | 104 |
| *Pseudostenophylax* sp. | 3 | 13 | | | | | 1 |
| *Glossosoma* sp. | 1 | | | 1 | 2 | 1 | 1 |
| *Hydroptila* sp. | | 85 | 14 | 1 | 18 | | 4 |

Appendix 23 (Cont'd.)

D. November 27, 1980 (Cont'd.)

| Site | 21 | 2 | 5A | 3A (i) | 3A (ii) | 3A (iii) | 3A (iv) |
|---|---|---|---|---|---|---|---|
| TAXA | | | | | | | |
| Diptera | | | | | | | |
| Chironomidae | | | | | | | |
| Procladius sp. | 4 | 43 | 82 | 2 | 30 | 3 | 13 |
| Undet. Tanypodinae | | | | | | | 1 |
| Micropsectra sp. | 22 | 166 | 630 | 11 | 87 | 2 | 99 |
| Heterotrissocladius sp. | 1 | 4 | 12 | 1 | 1 | | 3 |
| Trichocladius sp. | 1 | | | | | | |
| Polypedilum sp. | 1 | 20 | 11 | 1 | 16 | 1 | 18 |
| Cricotopus sp. | | 5 | 14 | 4 | 6 | | 6 |
| Eukiefferiella sp. | | 2 | | | | | 1 |
| Diplocladius sp. | | | | 3 | | | |
| Cryptochironomus sp. | | 1 | | | | | 1 |
| Glyptotendipes sp? | | 1 | 3 | | | | |
| Pseudochironomus sp. | | 1 | 4 | | | | |
| Simuliidae, undet. larvae | | 3 | 4 | | | 1 | 24 |
| Simulium sp. pupae | | | 1 | | | | |
| Empididae | | | | | | | |
| Clinocera sp. | 2 | | 2 | | 1 | | 1 |
| Ceratopogonidae | | | | | | | |
| Culicoides sp. | | 1 | | | | | |
| Palpomyia sp. | | 1 | | | 1 | | |
| Tipulidae | | | | | | | |
| Tipula sp. | | 1 | | 1 | 1 | | 1 |
| Hemiptera | | | | | | | |
| Trichocorixa sp. | | 1 | | | | | |
| Collembola | | | 1 | | | | |
| Mollusca | | | | | | | |
| Heliosoma sp. | | | 1 | | | | 1 |
| Shell of Lymnaea sp. | | | 3 | | | | |
| Valvata sp. | 2 | | | | | | |
| Physa sp. | | | | | | | 1 |
| Pisidium sp. | 6 | 6 | 45 | | 21 | 2 | 2 |
| Nematoda | | 24 | 8 | 1 | 9 | 1 | 3 |
| Oligochaeta | | | | | | | |
| Pristina (foreli?) | | | 2 | | 1 | | |
| Uncinais uncinata | | 9 | 17 | 1 | 3 | | |
| Nais (communis?) | 3 | 3 | 2 | | 2 | | 6 |
| Rhyacodrilus sp. | | 2 | | | | 2 | |
| Undet. juv. tubificid | | 2 | | | | | |
| Enchytraeidae | | | 2 | | 1 | | 1 |
| Telmatodrilus sp. | | | | | | | 6 |
| Coelenterata | | | | | | | |
| Hydra sp. | | 5 | 1 | | 2 | 1 | 3 |

Appendix 23 (Cont'd.)

D. November 27, 1980 (Cont'd.)

| Site | 21 | 2 | 5A | 3A (i) | 3A (ii) | 3A (iii) | 3A (iv) |
|---|---|---|---|---|---|---|---|
| TAXA | | | | | | | |
| Ostracoda | | 1 | 1 | 4 | 2 | | |
| Acari | | 2 | 2 | | 1 | | |
| Calanoida | | | | | | | |
| *Diaptomus ashlandi* | | 1 | 10 | 1 | 5 | | 4 |
| *Epischura nevadensis* | | | 4 | 2 | 3 | 1 | 1 |
| Harpacticoida | | | | | | | |
| *Attheyella nordenskioldii* | | | 1 | | | | |
| Cyclopoida | | | | | | | |
| *Cyclops scutifer* | | | | | 1 | | 1 |
| Turbellaria | | | | | | | |
| *Phagocata* (*velata*?) | | | | | | | 1 |
| Total No. organisms | 50 | 485 | 962 | 42 | 246 | 25 | 448 |
| Total No. taxa | 13 | 32 | 34 | 18 | 29 | 14 | 34 |

[a] Larger numbers of taxa reported are indicative of identification to species of several organisms formerly keyed to family level only.

Appendix 24a. Mean number of organisms per $m^2$ in Nechako River benthos sampled at site No.3, April – September 1981.

NECHAKO BENTHIC SITE 3 SAMPLING DATE 04-27-81 GEAR: MUNDIE

| | TAXA | POOL MEAN | POOL S.D. | POOL %COMP | POOL %DATE | RIFFLE MEAN | RIFFLE S.D. | RIFFLE %COMP | RIFFLE %DATE | RUN MEAN | RUN S.D. | RUN %COMP | RUN %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 409.3 | 421.3 | 24.87 | 2.4 | 1510.3 | 336.0 | 14.60 | 6.5 | 6563.7 | 8037.9 | 62.01 | 28.4 |
| | *Simuliidae | 0.0 | 0.0 | 0.0 | 0.0 | 146.0 | 162.9 | 1.41 | 0.6 | 1.3 | 2.3 | 0.01 | 0.0 |
| | *Ceratopogonidae | 27.5 | 4.7 | 1.67 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Empididae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Tipulidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 |
| | *Muscidea | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 9.8 | 16.3 | 0.59 | 0.1 | 18.7 | 19.6 | 0.18 | 0.1 | 93.3 | 161.7 | 0.88 | 0.4 |
| Ephemeroptera | *Ephemerellidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 46.3 | 70.1 | 0.44 | 0.2 |
| | *Heptageniidae | 0.0 | 0.0 | 0.0 | 0.0 | 66.7 | 66.4 | 0.64 | 0.3 | 22.7 | 21.2 | 0.21 | 0.1 |
| | *Baetidae | 914.8 | 1717.4 | 55.59 | 5.3 | 404.3 | 312.4 | 3.91 | 1.7 | 52.0 | 73.4 | 0.49 | 0.2 |
| | *Siphonuridae | 9.0 | 12.3 | 0.55 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 46.7 | 80.8 | 0.44 | 0.2 |
| | Caenidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Leptophlebiidae | 13.0 | 17.5 | 0.79 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 |
| | Unknown | 1.3 | 2.5 | 0.08 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tricoptera | *Hydroptilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 186.7 | 316.4 | 1.76 | 0.8 |
| | *Hydropsychidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 159.7 | 273.1 | 1.51 | 0.7 |
| | *Leptoceridae | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 | 37.7 | 39.1 | 0.36 | 0.2 |
| | *Glossosmatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 |
| | *Lepidostomatidae | 1.3 | 2.5 | 0.08 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.0 | 12.1 | 0.07 | 0.0 |
| | Psychomyiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Polycentropodidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plecoptera | *Chloroperlidae | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 | 14.3 | 24.8 | 0.14 | 0.1 |
| | *Perlodidae | 0.0 | 0.0 | 0.0 | 0.0 | 8.3 | 7.5 | 0.08 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Nemouridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | 9.8 | 19.5 | 0.59 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Haliplidae | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hemiptera | *Corixidae | 85.3 | 53.2 | 5.18 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Basommatophora | Lymnaeidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Planorbidae | 4.0 | 8.0 | 0.24 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mesogastropoda | Valvatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Eulamellibranchia | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Heterodonta | Sphaeriidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ostracoda | | 7.0 | 14.0 | 0.43 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Acari | | 8.3 | 16.5 | 0.50 | 0.0 | 23.3 | 40.4 | 0.23 | 0.1 | 46.7 | 80.8 | 0.44 | 0.2 |
| Oligochaeta | | 29.5 | 59.0 | 1.79 | 0.2 | 117.0 | 40.7 | 1.13 | 0.5 | 326.3 | 428.1 | 3.08 | 1.4 |
| Nematoda | | 42.8 | 41.5 | 2.60 | 0.2 | 46.7 | 40.4 | 0.45 | 0.2 | 210.3 | 273.9 | 1.99 | 0.9 |
| Hirudinea | | 7.8 | 15.5 | 0.47 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tardigrada | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Copepoda | | 44.0 | 48.0 | 2.67 | 0.3 | 7987.7 | 5229.4 | 77.22 | 34.5 | 2755.7 | 3442.1 | 26.04 | 11.9 |
| Cladocera | | 2.8 | 5.5 | 0.17 | 0.0 | 11.7 | 20.2 | 0.11 | 0.1 | 4.0 | 6.9 | 0.04 | 0.0 |
| OTHERS | | 18.8 | 18.4 | 1.14 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 5.7 | 6.7 | 0.05 | 0.0 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 1645.5 | 2300.5 | | | 10344.7 | 5085.1 | | | 10584.0 | 12263.9 | | |
| MEAN NO. OF MACROFAUNA ONLY | | 173.3 | 115.2 | | | 107.0 | 77.4 | | | 447.3 | 246.1 | | |
| NUMBER OF REPLICATES | | 4 | | | | 3 | | | | 3 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24a (cont'd.)

NECHAKO BENTHIC SITE 3 SAMPLING DATE 06-03-81 GEAR: MUNDIE

| | TAXA | POOL MEAN | POOL S.D. | POOL %COMP | POOL %DATE | RIFFLE MEAN | RIFFLE S.D. | RIFFLE %COMP | RIFFLE %DATE | RUN MEAN | RUN S.D. | RUN %COMP | RUN %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 6869.0 | 4885.9 | 54.31 | 18.1 | 11937.0 | 10885.2 | 75.19 | 23.6 | 12430.0 | 2557.5 | 69.43 | 24.5 |
| | *Simuliidae | 0.0 | 0.0 | 0.0 | 0.0 | 184.0 | 162.1 | 1.16 | 0.4 | 3.0 | 5.2 | 0.02 | 0.0 |
| | *Ceratopogonidae | 2054.8 | 1390.5 | 16.25 | 5.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Empididae | 22.3 | 44.5 | 0.18 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Tipulidae | 4.3 | 5.3 | 0.03 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.3 | 4.5 | 0.02 | 0.0 |
| | *Muscidea | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 4.3 | 5.3 | 0.03 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 31.0 | 53.7 | 0.17 | 0.1 |
| Ephemeroptera | *Ephemerellidae | 44.5 | 89.0 | 0.35 | 0.1 | 1214.7 | 1328.3 | 7.65 | 2.4 | 259.3 | 188.7 | 1.45 | 0.5 |
| | *Heptageniidae | 23.8 | 47.5 | 0.19 | 0.1 | 290.0 | 491.9 | 1.83 | 0.6 | 152.3 | 131.5 | 0.85 | 0.3 |
| | *Baetidae | 12.5 | 21.2 | 0.10 | 0.0 | 389.7 | 400.9 | 2.45 | 0.8 | 55.0 | 84.9 | 0.31 | 0.1 |
| | *Siphonuridae | 72.8 | 95.8 | 0.58 | 0.2 | 1.3 | 2.3 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Caenidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Leptophlebiidae | 0.0 | 0.0 | 0.0 | 0.0 | 163.3 | 282.9 | 1.03 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 373.7 | 530.6 | 2.09 | 0.7 |
| Tricoptera | *Hydroptilidae | 276.5 | 538.4 | 2.19 | 0.7 | 448.0 | 705.3 | 2.82 | 0.9 | 189.0 | 16.5 | 1.06 | 0.4 |
| | *Hydropsychidae | 133.3 | 266.5 | 1.05 | 0.4 | 483.0 | 658.0 | 3.04 | 1.0 | 237.7 | 215.4 | 1.33 | 0.5 |
| | *Leptoceridae | 11.0 | 22.0 | 0.09 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 94.7 | 160.5 | 0.53 | 0.2 |
| | *Glossosmatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Lepidostomatidae | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 | 6.9 | 0.03 | 0.0 | 4.0 | 0.0 | 0.02 | 0.0 |
| | Psychomyiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Polycentropodidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plecoptera | *Chloroperlidae | 0.0 | 0.0 | 0.0 | 0.0 | 21.3 | 26.5 | 0.13 | 0.0 | 58.0 | 79.3 | 0.32 | 0.1 |
| | *Perlodidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Nemouridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | 3.0 | 3.5 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 |
| | *Haliplidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hemiptera | *Corixidae | 21.0 | 10.4 | 0.17 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Basommatophora | Lymnaeidae | 8.8 | 10.1 | 0.07 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Planorbidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mesogastropoda | Valvatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Eulamellibranchia | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Heterodonta | Sphaeriidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ostracoda | | 22.3 | 44.5 | 0.18 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 93.3 | 161.7 | 0.52 | 0.2 |
| Acari | | 37.5 | 42.3 | 0.30 | 0.1 | 163.3 | 145.7 | 1.03 | 0.3 | 657.0 | 793.5 | 3.67 | 1.3 |
| Oligochaeta | | 667.0 | 674.1 | 5.27 | 1.8 | 287.7 | 172.2 | 1.81 | 0.6 | 2617.3 | 2740.3 | 14.62 | 5.2 |
| Nematoda | | 966.8 | 842.4 | 7.64 | 2.5 | 155.3 | 74.9 | 0.98 | 0.3 | 498.0 | 176.4 | 2.78 | 1.0 |
| Hirudinea | | 1.5 | 3.0 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tardigrada | | 44.5 | 89.0 | 0.35 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Copepoda | | 1028.3 | 1102.7 | 8.13 | 2.7 | 124.3 | 142.6 | 0.78 | 0.2 | 93.3 | 161.7 | 0.52 | 0.2 |
| Cladocera | | 291.5 | 248.2 | 2.30 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHERS | | 27.0 | 27.6 | 0.21 | 0.1 | 7.0 | 6.6 | 0.04 | 0.0 | 51.0 | 77.3 | 0.28 | 0.1 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 12647.8 | 6885.9 | | | 15875.3 | 10747.3 | | | 17903.3 | 6492.3 | | |
| MEAN NO. OF MACROFAUNA ONLY | | 329.5 | 372.5 | | | 242.3 | 110.0 | | | 713.3 | 641.9 | | |
| NUMBER OF REPLICATES | | 4 | | | | 3 | | | | 3 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24a (cont'd.)

NECHAKO BENTHIC SITE 3 SAMPLING DATE 07-20-81 GEAR: MUNDIE

| TAXA | | POOL MEAN | POOL S.D. | POOL %COMP | POOL %DATE | RIFFLE MEAN | RIFFLE S.D. | RIFFLE %COMP | RIFFLE %DATE | RUN MEAN | RUN S.D. | RUN %COMP | RUN %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 6191.0 | 6135.5 | 28.31 | 12.7 | 11992.0 | 5176.5 | 71.31 | 18.4 | 13234.0 | 3636.6 | 68.65 | 20.3 |
| | *Simulidae | 0.0 | 0.0 | 0.0 | 0.0 | 70.0 | 70.0 | 0.42 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Ceratopogonidae | 102.8 | 95.1 | 0.47 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Empididae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 24.3 | 42.1 | 0.13 | 0.0 |
| | *Tipulidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 |
| | *Muscidea | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 1.5 | 3.0 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ephemeroptera | *Ephemerellidae | 0.0 | 0.0 | 0.0 | 0.0 | 572.7 | 352.4 | 3.41 | 0.9 | 1297.0 | 420.1 | 6.73 | 2.0 |
| | *Heptageniidae | 4.3 | 5.3 | 0.02 | 0.0 | 253.7 | 234.5 | 1.51 | 0.4 | 237.7 | 187.1 | 1.23 | 0.4 |
| | *Baetidae | 151.5 | 182.9 | 0.69 | 0.3 | 32.0 | 40.7 | 0.19 | 0.0 | 70.0 | 70.0 | 0.36 | 0.1 |
| | *Siphonuridae | 1.5 | 3.0 | 0.01 | 0.0 | 23.3 | 40.4 | 0.14 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Caenidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Leptophlebiidae | 96.0 | 131.2 | 0.44 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 93.3 | 80.8 | 0.48 | 0.1 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Trichoptera | *Hydroptilidae | 47.3 | 48.4 | 0.22 | 0.1 | 23.3 | 40.4 | 0.14 | 0.0 | 29.0 | 46.8 | 0.15 | 0.0 |
| | *Hydropsychidae | 0.0 | 0.0 | 0.0 | 0.0 | 177.7 | 95.0 | 1.06 | 0.3 | 186.3 | 139.2 | 0.97 | 0.3 |
| | *Leptoceridae | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 2.3 | 0.02 | 0.0 | 144.3 | 246.5 | 0.75 | 0.2 |
| | *Glossosmatidae | 0.0 | 0.0 | 0.0 | 0.0 | 23.3 | 40.4 | 0.14 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Lepidostomatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Psychomyiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Polycentropoditdae | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 | 4.0 | 4.0 | 0.02 | 0.0 |
| Plecoptera | *Chloroperlidae | 0.0 | 0.0 | 0.0 | 0.0 | 4.3 | 7.5 | 0.03 | 0.0 | 7.3 | 9.5 | 0.04 | 0.0 |
| | *Perlodidae | 0.0 | 0.0 | 0.0 | 0.0 | 103.7 | 39.3 | 0.62 | 0.2 | 52.3 | 79.4 | 0.27 | 0.1 |
| | Nemouridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | 40.3 | 38.4 | 0.18 | 0.1 | 281.3 | 483.8 | 1.67 | 0.4 | 116.7 | 106.9 | 0.61 | 0.2 |
| | *Haliplidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hemiptera | *Corixidae | 460.3 | 474.9 | 2.10 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 46.7 | 80.8 | 0.24 | 0.1 |
| Basommatophora | Lymnaeidae | 4.3 | 5.3 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 72.7 | 70.0 | 0.38 | 0.1 |
| | Planorbidae | 0.0 | 0.0 | 0.0 | 0.0 | 46.7 | 80.8 | 0.28 | 0.1 | 46.7 | 80.8 | 0.24 | 0.1 |
| Mesogastropoda | Valvatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Eulamellibranchia | | 0.0 | 0.0 | 0.0 | 0.0 | 49.7 | 78.4 | 0.30 | 0.1 | 48.0 | 79.7 | 0.25 | 0.1 |
| Heterodonta | Sphaeriidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ostracoda | | 671.0 | 698.8 | 3.07 | 1.4 | 513.7 | 316.2 | 3.05 | 0.8 | 864.3 | 345.3 | 4.48 | 1.3 |
| Acari | | 211.0 | 393.2 | 0.96 | 0.4 | 1074.3 | 410.2 | 6.39 | 1.6 | 1027.7 | 213.9 | 5.33 | 1.6 |
| Oligochaeta | | 2382.3 | 1742.8 | 10.89 | 4.9 | 656.7 | 388.9 | 3.90 | 1.0 | 1312.3 | 825.3 | 6.81 | 2.0 |
| Nematoda | | 555.8 | 293.6 | 2.54 | 1.1 | 700.7 | 140.5 | 4.17 | 1.1 | 236.3 | 214.9 | 1.23 | 0.4 |
| Hirudinea | | 2.8 | 5.5 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tardigrada | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Copepoda | | 3355.8 | 3529.4 | 15.35 | 6.9 | 93.3 | 106.9 | 0.55 | 0.1 | 70.0 | 70.0 | 0.36 | 0.1 |
| Cladocera | | 7444.8 | 5513.9 | 34.04 | 15.2 | 116.7 | 145.7 | 0.69 | 0.2 | 46.7 | 80.8 | 0.24 | 0.1 |
| OTHERS | | 143.8 | 213.5 | 0.66 | 0.3 | 4.3 | 4.5 | 0.03 | 0.0 | 8.3 | 4.0 | 0.04 | 0.0 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 21867.5 | 13814.5 | | | 16817.3 | 6182.8 | | | 19277.3 | 4208.3 | | |
| MEAN NO. OF MACROFAUNA ONLY | | 287.5 | 293.6 | | | 408.7 | 144.7 | | | 498.3 | 130.2 | | |
| NUMBER OF REPLICATES | | 4 | | | | 3 | | | | 3 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24a (cont'd.)

NECHAKO BENTHIC SITE 3 SAMPLING DATE 09-29-81 GEAR: MUNDIE

| | TAXA | POOL MEAN | POOL S.D. | POOL %COMP | POOL %DATE | RIFFLE MEAN | RIFFLE S.D. | RIFFLE %COMP | RIFFLE %DATE | RUN MEAN | RUN S.D. | RUN %COMP | RUN %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 8470.3 | 1704.6 | 49.74 | 49.7 | | | | | | | | |
| | *Simuliidae | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| | *Ceratopogonidae | 83.5 | 115.6 | 0.49 | 0.5 | | | | | | | | |
| | *Empididae | 133.5 | 114.9 | 0.78 | 0.8 | | | | | | | | |
| | *Tipulidae | 44.5 | 51.4 | 0.26 | 0.3 | | | | | | | | |
| | *Muscidea | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| Ephemeroptera | *Ephemerellidae | 29.5 | 44.2 | 0.17 | 0.2 | | | | | | | | |
| | *Heptagenitidae | 25.0 | 43.0 | 0.15 | 0.1 | | | | | | | | |
| | *Baetidae | 1.5 | 3.0 | 0.01 | 0.0 | | | | | | | | |
| | *Siphonuridae | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| | Caenidae | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| | Leptophlebiidae | 26.5 | 53.0 | 0.16 | 0.2 | | | | | | | | |
| | Unknown | 1.5 | 3.0 | 0.01 | 0.0 | | | | | | | | |
| Tricoptera | *Hydroptilidae | 2089.3 | 2460.9 | 12.27 | 12.3 | | | | | | | | |
| | *Hydropsychidae | 7.0 | 14.0 | 0.04 | 0.0 | | | | | | | | |
| | *Leptoceridae | 90.5 | 181.0 | 0.53 | 0.5 | | | | | | | | |
| | *Glossosmatidae | 111.3 | 85.2 | 0.65 | 0.7 | | | | | | | | |
| | *Lepidostomatidae | 29.5 | 47.3 | 0.17 | 0.2 | | | | | | | | |
| | Psychomyiidae | 23.8 | 43.6 | 0.14 | 0.1 | Not sampled. | | | | Not sampled. | | | |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| | *Polycentropodidae | 93.5 | 175.1 | 0.55 | 0.5 | | | | | | | | |
| Plecoptera | *Chloroperlidae | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| | *Perlodidae | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| | Nemouridae | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| Coleoptera | *Dytiscidae | 13.8 | 13.8 | 0.08 | 0.1 | | | | | | | | |
| | *Haliplidae | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| Hemiptera | *Corixidae | 73.8 | 55.3 | 0.43 | 0.4 | | | | | | | | |
| Basommatophora | Lymnaeidae | 1.5 | 3.0 | 0.01 | 0.0 | | | | | | | | |
| | Planorbidae | 167.0 | 113.9 | 0.98 | 1.0 | | | | | | | | |
| Mesogastropoda | Valvatidae | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| Eulamellibranchia | | 1.5 | 3.0 | 0.01 | 0.0 | | | | | | | | |
| Heterodonta | Sphaeriidae | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| Ostracoda | | 178.0 | 205.5 | 1.05 | 1.0 | | | | | | | | |
| Acari | | 601.5 | 603.5 | 3.53 | 3.5 | | | | | | | | |
| Oligochaeta | | 478.5 | 297.9 | 2.81 | 2.8 | | | | | | | | |
| Nematoda | | 1155.5 | 557.7 | 6.79 | 6.8 | | | | | | | | |
| Hirudinea | | 4.5 | 9.0 | 0.03 | 0.0 | | | | | | | | |
| Tardigrada | | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| Amphipoda | *Talitridae | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | |
| Copepoda | | 2400.5 | 3066.9 | 14.10 | 14.1 | | | | | | | | |
| Cladocera | | 622.3 | 733.0 | 3.65 | 3.7 | | | | | | | | |
| OTHERS | | 70.3 | 62.5 | 0.41 | 0.4 | | | | | | | | |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 17029.0 | 7604.3 | | | | | | | | | | |
| MEAN NO. OF MACROFAUNA ONLY | | 292.8 | 190.7 | | | | | | | | | | |
| NUMBER OF REPLICATES | | 4 | | | | | | | | | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24a (cont'd.)

NECHAKO BENTHIC SITE 3 SAMPLING DATE 04-26-81 GEAR: GALEN

| TAXA | | NEARSHORE MEAN | NEARSHORE S.D. | NEARSHORE %COMP | NEARSHORE %DATE | 1/4 CHANNEL MEAN | 1/4 CHANNEL S.D. | 1/4 CHANNEL %COMP | 1/4 CHANNEL %DATE | 1/2 CHANNEL MEAN | 1/2 CHANNEL S.D. | 1/2 CHANNEL %COMP | 1/2 CHANNEL %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 15808.7 | 6794.6 | 78.63 | 27.9 | 5383.7 | 4838.4 | 64.41 | 9.5 | 35143.0 | 22675.5 | 83.06 | 41.3 |
| | *Simuliidae | 2.0 | 3.5 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 97.5 | 137.9 | 0.23 | 0.1 |
| | *Ceratopogonidae | 18.3 | 26.7 | 0.09 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Empididae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Tipulidae | 10.0 | 12.5 | 0.05 | 0.0 | 2.0 | 3.5 | 0.02 | 0.0 | 6.0 | 8.5 | 0.01 | 0.0 |
| | *Muscidea | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 2.0 | 3.5 | 0.01 | 0.0 | 64.0 | 110.9 | 0.77 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ephemeroptera | *Ephemerellidae | 162.7 | 127.0 | 0.81 | 0.3 | 105.7 | 89.8 | 1.26 | 0.2 | 73.0 | 60.8 | 0.17 | 0.1 |
| | *Heptagenitidae | 6.0 | 6.0 | 0.03 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 45.0 | 21.2 | 0.11 | 0.1 |
| | *Baetidae | 108.0 | 55.4 | 0.54 | 0.2 | 258.7 | 100.2 | 3.09 | 0.5 | 9.0 | 12.7 | 0.02 | 0.0 |
| | *Siphonuridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Caenidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Leptophlebiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tricoptera | *Hydroptilidae | 1675.3 | 739.4 | 8.33 | 3.0 | 900.3 | 925.7 | 10.77 | 1.6 | 3908.0 | 4975.2 | 9.24 | 4.6 |
| | *Hydropsychidae | 175.0 | 136.8 | 0.87 | 0.3 | 70.7 | 40.5 | 0.85 | 0.1 | 1343.0 | 1692.8 | 3.17 | 1.6 |
| | *Leptoceridae | 107.7 | 88.9 | 0.54 | 0.2 | 83.7 | 75.9 | 1.00 | 0.1 | 6.0 | 8.5 | 0.01 | 0.0 |
| | *Glossosmatidae | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 | 6.9 | 0.05 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Lepidostomatidae | 18.3 | 26.7 | 0.09 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Psychomyiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Polycentropodidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plecoptera | *Chloroperlidae | 453.0 | 161.5 | 2.25 | 0.8 | 307.3 | 163.5 | 3.68 | 0.5 | 3.0 | 4.2 | 0.01 | 0.0 |
| | *Perlodidae | 4.0 | 3.5 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Nemouridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Haliplidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hemiptera | *Corixidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Basommatophora | Lymnaeidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 4.2 | 0.01 | 0.0 |
| | Planorbidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mesogastropoda | Valvatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 4.2 | 0.01 | 0.0 |
| Eulamellibranchia | | 178.7 | 140.7 | 0.89 | 0.3 | 142.7 | 125.0 | 1.71 | 0.3 | 100.5 | 133.6 | 0.24 | 0.1 |
| Heterodonta | Sphaeriidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ostracoda | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Acari | | 715.3 | 491.2 | 3.56 | 1.3 | 292.3 | 425.1 | 3.50 | 0.5 | 195.0 | 275.8 | 0.46 | 0.2 |
| Oligochaeta | | 219.7 | 319.3 | 1.09 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 201.0 | 267.3 | 0.48 | 0.2 |
| Nematoda | | 16.3 | 28.3 | 0.08 | 0.0 | 81.3 | 74.7 | 0.97 | 0.1 | 487.5 | 413.7 | 1.15 | 0.6 |
| Hirudinea | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 | 8.5 | 0.01 | 0.0 |
| Tardigrada | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Copepoda | | 423.0 | 500.8 | 2.10 | 0.7 | 660.3 | 104.0 | 7.90 | 1.2 | 682.0 | 964.5 | 1.61 | 0.8 |
| Cladocera | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHERS | | 2.0 | 3.5 | 0.01 | 0.0 | 2.0 | 3.5 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 20106.0 | 8015.0 | | | 8358.7 | 6563.0 | | | 42311.5 | 25268.5 | | |
| MEAN NO. OF MACROFAUNA ONLY | | 711.3 | 1008.3 | | | 265.7 | 218.3 | | | 278.5 | 275.1 | | |
| NUMBER OF REPLICATES | | 3 | | | | 3 | | | | 2 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24a (cont'd.)

NECHAKO BENTHIC SITE 3 SAMPLING DATE 06-03-81 GEAR: GALEN

| TAXA | | NEARSHORE MEAN | NEARSHORE S.D. | NEARSHORE %COMP | NEARSHORE %DATE | 1/4 CHANNEL MEAN | 1/4 CHANNEL S.D. | 1/4 CHANNEL %COMP | 1/4 CHANNEL %DATE | 1/2 CHANNEL MEAN | 1/2 CHANNEL S.D. | 1/2 CHANNEL %COMP | 1/2 CHANNEL %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 11509.3 | 3099.9 | 68.17 | 38.0 | 3368.7 | 1827.6 | 43.49 | 11.1 | 2179.7 | 183.1 | 38.45 | 7.2 |
| | *Simuliidae | 4.0 | 6.9 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Ceratopogonidae | 121.3 | 128.6 | 0.72 | 0.4 | 20.3 | 25.5 | 0.26 | 0.1 | 38.7 | 34.7 | 0.68 | 0.1 |
| | *Empididae | 43.3 | 75.1 | 0.26 | 0.1 | 16.3 | 28.3 | 0.21 | 0.1 | 20.3 | 25.5 | 0.36 | 0.1 |
| | *Tipulidae | 116.7 | 11.5 | 0.69 | 0.4 | 14.0 | 19.3 | 0.18 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Muscidea | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 32.7 | 56.6 | 0.19 | 0.1 | 34.7 | 54.9 | 0.45 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ephemeroptera | *Ephemerellidae | 162.7 | 76.2 | 0.96 | 0.5 | 174.3 | 96.3 | 2.25 | 0.6 | 150.0 | 67.0 | 2.65 | 0.5 |
| | *Heptageniidae | 44.3 | 33.6 | 0.26 | 0.1 | 2.0 | 3.5 | 0.03 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Baetidae | 79.0 | 116.7 | 0.47 | 0.3 | 28.3 | 28.9 | 0.37 | 0.1 | 55.0 | 84.9 | 0.97 | 0.2 |
| | *Siphonuridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Caenidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Leptophlebiidae | 130.0 | 225.2 | 0.77 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 32.7 | 56.6 | 0.19 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 22.3 | 38.7 | 0.39 | 0.1 |
| Tricoptera | *Hydroptilidae | 1899.3 | 902.7 | 11.25 | 6.3 | 286.3 | 192.1 | 3.70 | 0.9 | 280.7 | 195.8 | 4.95 | 0.9 |
| | *Hydropsychidae | 583.7 | 708.0 | 3.46 | 1.9 | 240.3 | 135.4 | 3.10 | 0.8 | 241.7 | 129.7 | 4.26 | 0.8 |
| | *Leptoceridae | 140.0 | 226.9 | 0.83 | 0.5 | 202.3 | 197.1 | 2.61 | 0.7 | 59.3 | 24.8 | 1.05 | 0.2 |
| | *Glossosmatidae | 0.0 | 0.0 | 0.0 | 0.0 | 22.0 | 9.2 | 0.28 | 0.1 | 2.0 | 3.5 | 0.04 | 0.0 |
| | *Lepidostomatidae | 6.0 | 6.0 | 0.04 | 0.0 | 10.0 | 12.5 | 0.13 | 0.0 | 36.7 | 53.5 | 0.65 | 0.1 |
| | Psychomyiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Polycentropodidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plecoptera | *Chloroperlidae | 16.0 | 3.5 | 0.09 | 0.1 | 315.0 | 83.6 | 4.07 | 1.0 | 123.7 | 29.8 | 2.18 | 0.4 |
| | *Perlodidae | 4.0 | 6.9 | 0.02 | 0.0 | 4.0 | 6.9 | 0.05 | 0.0 | 6.0 | 6.0 | 0.11 | 0.0 |
| | Nemouridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Haliplidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hemiptera | *Corixidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Basommatophora | Lymnaeidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Planorbidae | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 3.5 | 0.03 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mesogastropoda | Valvatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Eulamellibranchia | | 177.0 | 141.0 | 1.05 | 0.6 | 833.0 | 93.3 | 10.75 | 2.7 | 524.0 | 194.1 | 9.24 | 1.7 |
| Heterodonta | Sphaeriidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ostracoda | | 0.0 | 0.0 | 0.0 | 0.0 | 16.3 | 28.3 | 0.21 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Acari | | 721.7 | 399.5 | 4.27 | 2.4 | 1758.0 | 542.9 | 22.70 | 5.8 | 1493.0 | 386.3 | 26.34 | 4.9 |
| Oligochaeta | | 598.3 | 84.0 | 3.54 | 2.0 | 205.3 | 81.9 | 2.65 | 0.7 | 212.0 | 19.1 | 3.74 | 0.7 |
| Nematoda | | 396.3 | 186.6 | 2.35 | 1.3 | 73.0 | 73.0 | 0.94 | 0.2 | 91.3 | 133.1 | 1.61 | 0.3 |
| Hirudinea | | 6.0 | 6.0 | 0.04 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 3.5 | 0.04 | 0.0 |
| Tardigrada | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Copepoda | | 0.0 | 0.0 | 0.0 | 0.0 | 73.3 | 64.6 | 0.95 | 0.2 | 87.7 | 83.0 | 1.55 | 0.3 |
| Cladocera | | 43.3 | 75.1 | 0.26 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHERS | | 16.0 | 18.3 | 0.09 | 0.1 | 46.3 | 24.5 | 0.60 | 0.2 | 42.7 | 53.1 | 0.75 | 0.1 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 16883.7 | 3385.9 | | | 7746.0 | 2914.0 | | | 5668.7 | 589.7 | | |
| MEAN NO. OF MACROFAUNA ONLY | | 1651.0 | 1141.4 | | | 1096.7 | 343.0 | | | 598.0 | 130.0 | | |
| NUMBER OF REPLICATES | | 3 | | | | 3 | | | | 3 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24a (cont'd.)

NECHAKO BENTHIC SITE 3 SAMPLING DATE 07-21-81 GEAR: GALEN

| | TAXA | NEARSHORE MEAN | NEARSHORE S.D. | NEARSHORE %COMP | NEARSHORE %DATE | 1/4 CHANNEL MEAN | 1/4 CHANNEL S.D. | 1/4 CHANNEL %COMP | 1/4 CHANNEL %DATE | 1/2 CHANNEL MEAN | 1/2 CHANNEL S.D. | 1/2 CHANNEL %COMP | 1/2 CHANNEL %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 5246.3 | 2044.3 | 72.43 | 19.1 | 4579.0 | 1339.3 | 48.31 | 16.7 | 7003.0 | 1928.2 | 65.01 | 25.5 |
| | *Simuliidae | 31.7 | 36.1 | 0.44 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Ceratopogonidae | 0.0 | 0.0 | 0.0 | 0.0 | 23.7 | 35.9 | 0.25 | 0.1 | 32.7 | 56.6 | 0.30 | 0.1 |
| | *Empididae | 8.0 | 13.9 | 0.11 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Tipulidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Muscidea | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 | 3.5 | 0.04 | 0.0 | 34.7 | 60.0 | 0.32 | 0.1 |
| Ephemeroptera | *Ephemerellidae | 419.0 | 96.2 | 5.78 | 1.5 | 323.7 | 91.5 | 3.41 | 1.2 | 391.7 | 164.8 | 3.64 | 1.4 |
| | *Heptageniidae | 230.0 | 74.6 | 3.18 | 0.8 | 46.0 | 35.0 | 0.49 | 0.2 | 4.0 | 6.9 | 0.04 | 0.0 |
| | *Baetidae | 37.3 | 41.5 | 0.52 | 0.1 | 52.7 | 80.8 | 0.56 | 0.2 | 153.0 | 119.7 | 1.42 | 0.6 |
| | *Siphonuridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Caenidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Leptophlebiidae | 12.0 | 15.9 | 0.17 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 21.7 | 37.5 | 0.23 | 0.1 | 64.7 | 51.0 | 0.60 | 0.2 |
| Trichoptera | *Hydroptilidae | 63.7 | 74.4 | 0.88 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 | 6.0 | 0.06 | 0.0 |
| | *Hydropsychidae | 108.3 | 22.8 | 1.50 | 0.4 | 185.0 | 179.2 | 1.95 | 0.7 | 163.7 | 124.6 | 1.52 | 0.6 |
| | *Leptoceridae | 44.3 | 40.1 | 0.61 | 0.2 | 238.7 | 89.1 | 2.52 | 0.9 | 221.0 | 157.6 | 2.05 | 0.8 |
| | *Glossosmatidae | 8.0 | 13.9 | 0.11 | 0.0 | 16.3 | 28.3 | 0.17 | 0.1 | 32.7 | 56.6 | 0.30 | 0.1 |
| | *Lepidostomatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 | 6.0 | 0.06 | 0.0 |
| | Psychomyiidae | 10.0 | 6.9 | 0.14 | 0.0 | 47.3 | 82.0 | 0.50 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Polycentropodidae | 2.0 | 3.5 | 0.03 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plecoptera | *Chloroperlidae | 4.0 | 3.5 | 0.06 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Perlodidae | 12.0 | 12.0 | 0.17 | 0.0 | 73.0 | 71.7 | 0.77 | 0.3 | 10.0 | 9.2 | 0.09 | 0.0 |
| | Nemouridae | 0.0 | 0.0 | 0.0 | 0.0 | 44.7 | 57.8 | 0.47 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | 11.0 | 19.1 | 0.15 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Haliplidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hemiptera | *Corixidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Basommatophora | Lymnaeidae | 42.3 | 36.5 | 0.58 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Planorbidae | 12.0 | 12.0 | 0.17 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mesogastropoda | Valvatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Eulamellibranchia | | 158.0 | 57.2 | 2.18 | 0.6 | 1533.3 | 502.5 | 16.18 | 5.6 | 807.7 | 168.6 | 7.50 | 2.9 |
| Heterodonta | Sphaeriidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ostracoda | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 16.3 | 28.3 | 0.15 | 0.1 |
| Acari | | 251.3 | 52.5 | 3.47 | 0.9 | 1921.3 | 607.5 | 20.27 | 7.0 | 1073.0 | 798.6 | 9.96 | 3.9 |
| Oligochaeta | | 212.3 | 105.0 | 2.93 | 0.8 | 148.3 | 51.5 | 1.57 | 0.5 | 586.7 | 380.6 | 5.45 | 2.1 |
| Nematoda | | 210.3 | 199.7 | 2.90 | 0.8 | 92.0 | 80.1 | 0.97 | 0.3 | 84.7 | 78.9 | 0.79 | 0.3 |
| Hirudinea | | 4.0 | 6.9 | 0.06 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tardigrada | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Copepoda | | 21.7 | 37.5 | 0.30 | 0.1 | 119.3 | 67.6 | 1.26 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cladocera | | 40.7 | 51.1 | 0.56 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHERS | | 42.7 | 48.8 | 0.59 | 0.2 | 8.0 | 6.9 | 0.08 | 0.0 | 81.3 | 65.3 | 0.75 | 0.3 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 7243.0 | 2220.5 | | | 9478.0 | 2430.7 | | | 10772.7 | 1804.4 | | |
| MEAN NO. OF MACROFAUNA ONLY | | 969.3 | 394.9 | | | 431.0 | 108.5 | | | 638.3 | 121.1 | | |
| NUMBER OF REPLICATES | | 3 | | | | 3 | | | | 3 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24a (cont'd.)

NECHAKO BENTHIC SITE 3 SAMPLING DATE 09-30-81 GEAR: GALEN

| TAXA | | NEARSHORE MEAN | NEARSHORE S.D. | NEARSHORE %COMP | NEARSHORE %DATE | 1/4 CHANNEL MEAN | 1/4 CHANNEL S.D. | 1/4 CHANNEL %COMP | 1/4 CHANNEL %DATE | 1/2 CHANNEL MEAN | 1/2 CHANNEL S.D. | 1/2 CHANNEL %COMP | 1/2 CHANNEL %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | | | | | 6118.0 | 1875.3 | 36.30 | 16.3 | 7878.7 | 3891.6 | 38.27 | 21.0 |
| | *Simulidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Ceratopogonidae | | | | | 108.7 | 99.7 | 0.64 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Empididae | | | | | 84.0 | 68.8 | 0.50 | 0.2 | 77.3 | 56.9 | 0.38 | 0.2 |
| | *Tipulidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 46.7 | 45.4 | 0.23 | 0.1 |
| | *Muscidea | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ephemeroptera | *Ephemerellidae | | | | | 3439.3 | 160.3 | 20.40 | 9.2 | 3166.7 | 375.7 | 15.38 | 8.5 |
| | *Heptageniidae | | | | | 605.7 | 320.1 | 3.59 | 1.6 | 550.7 | 715.2 | 2.67 | 1.5 |
| | *Baetidae | | | | | 46.7 | 51.1 | 0.28 | 0.1 | 47.0 | 46.8 | 0.23 | 0.1 |
| | *Siplonuridae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Caenidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Leptophlebiidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tricoptera | *Hydroptilidae | | | | | 298.7 | 121.6 | 1.77 | 0.8 | 883.7 | 321.3 | 4.29 | 2.4 |
| | *Hydropsychidae | | | | | 480.7 | 280.4 | 2.85 | 1.3 | 747.7 | 251.9 | 3.63 | 2.0 |
| | *Leptoceridae | | | | | 4.0 | 3.5 | 0.02 | 0.0 | 36.7 | 53.1 | 0.18 | 0.1 |
| | *Glossosmatidae | | | | | 43.3 | 75.1 | 0.26 | 0.1 | 44.7 | 61.8 | 0.22 | 0.1 |
| | *Lepidostomatidae | | | | | 8.0 | 6.9 | 0.05 | 0.0 | 10.0 | 12.5 | 0.05 | 0.0 |
| | Psychomyiidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Rhyacophilidae | Sample site not wetted | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Polycentropodidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 32.7 | 56.6 | 0.16 | 0.1 |
| Plecoptera | *Chloroperlidae | | | | | 780.0 | 555.9 | 4.63 | 2.1 | 229.7 | 248.8 | 1.12 | 0.6 |
| | *Perlodidae | | | | | 321.7 | 266.5 | 1.91 | 0.9 | 347.7 | 205.6 | 1.69 | 0.9 |
| | Nemouridae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Haliplidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hemiptera | *Corixidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Basommatophora | Lymnaeidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Planorbidae | | | | | 32.7 | 56.6 | 0.19 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mesogastropoda | Valvatidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Eulamellibranchia | | | | | | 225.7 | 214.5 | 1.34 | 0.6 | 422.3 | 94.5 | 2.05 | 1.1 |
| Heterodonta | Sphaeriidae | | | | | 10.0 | 17.3 | 0.06 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ostracoda | | | | | | 195.0 | 337.7 | 1.16 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| Acari | | | | | | 2287.3 | 943.6 | 13.57 | 6.1 | 3386.3 | 1039.8 | 16.45 | 9.0 |
| Oligochaeta | | | | | | 1561.3 | 1032.4 | 9.26 | 4.2 | 2407.0 | 1253.7 | 11.69 | 6.4 |
| Nematoda | | | | | | 67.3 | 116.6 | 0.40 | 0.2 | 195.3 | 97.5 | 0.95 | 0.5 |
| Hirudinea | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tardigrada | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Copepoda | | | | | | 86.7 | 150.1 | 0.51 | 0.2 | 32.7 | 56.6 | 0.16 | 0.1 |
| Cladocera | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHERS | | | | | | 51.3 | 69.2 | 0.30 | 0.1 | 44.7 | 52.2 | 0.22 | 0.1 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | | | | | 16856.0 | 3586.6 | | | 20588.0 | 5216.1 | | |
| MEAN NO. OF MACROFAUNA ONLY | | | | | | 453.0 | 48.5 | | | 779.3 | 173.4 | | |
| NUMBER OF REPLICATES | | | | | | 3 | | | | 3 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24b. Mean number of organisms per $m^2$ in Nechako River benthos sampled at site No.11, April – October 1981.

NECHAKO BENTHIC SITE 11 SAMPLING DATE 04-28-81 GEAR: MUNDIE

| | TAXA | POOL MEAN | POOL S.D. | POOL %COMP | POOL %DATE | RIFFLE MEAN | RIFFLE S.D. | RIFFLE %COMP | RIFFLE %DATE | RUN MEAN | RUN S.D. | RUN %COMP | RUN %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 2071.7 | 1222.1 | 7.90 | 5.7 | 3340.3 | 2336.1 | 43.42 | 9.3 | 2442.0 | 1520.3 | 76.22 | 4.5 |
| | *Simulidae | 0.0 | 0.0 | 0.0 | 0.0 | 2372.3 | 3173.2 | 30.83 | 6.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Ceratopogonidae | 1755.3 | 783.9 | 6.69 | 4.9 | 26.0 | 38.3 | 0.34 | 0.1 | 26.5 | 12.0 | 0.83 | 0.0 |
| | *Empididae | 185.0 | 171.6 | 0.71 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Tipulidae | 16.7 | 28.9 | 0.06 | 0.0 | 2.7 | 2.3 | 0.03 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Muscidea | 11.0 | 19.1 | 0.04 | 0.0 | 1.3 | 2.3 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ephemeroptera | *Ephemerellidae | 177.7 | 307.7 | 0.68 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Heptageniidae | 2.0 | 3.5 | 0.01 | 0.0 | 26.0 | 41.6 | 0.34 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Baetidae | 0.0 | 0.0 | 0.0 | 0.0 | 33.7 | 43.7 | 0.44 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Siphonuridae | 40.7 | 39.1 | 0.16 | 0.1 | 55.3 | 45.8 | 0.72 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Caenidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 2.8 | 0.06 | 0.0 |
| | Leptophlebiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tricoptera | *Hydroptilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Hydropsychidae | 0.0 | 0.0 | 0.0 | 0.0 | 58.0 | 50.4 | 0.75 | 0.2 | 17.5 | 6.4 | 0.55 | 0.0 |
| | *Leptoceridae | 2.0 | 3.5 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Glossosmatidae | 0.0 | 0.0 | 0.0 | 0.0 | 11.7 | 16.9 | 0.15 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Lepidostomatidae | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Psychomyiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Polycentropodidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plecoptera | *Chloroperlidae | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 2.3 | 0.03 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Perlodidae | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Nemouridae | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | 48.3 | 83.7 | 0.18 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Haliplidae | 13.3 | 12.7 | 0.05 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 2.8 | 0.06 | 0.0 |
| Hemiptera | *Corixidae | 9.7 | 8.7 | 0.04 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11.0 | 2.8 | 0.34 | 0.0 |
| Basommatophora | Lymnaeidae | 4.0 | 3.5 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Planorbidae | 0.0 | 0.0 | 0.0 | 0.0 | 4.3 | 4.5 | 0.06 | 0.0 | 13.0 | 18.4 | 0.41 | 0.0 |
| Mesogastropoda | Valvatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Eulamellibranchia | | 0.0 | 0.0 | 0.0 | 0.0 | 11.7 | 20.2 | 0.15 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Heterodonta | Sphaeriidae | 11.0 | 19.1 | 0.04 | 0.0 | 48.0 | 83.1 | 0.62 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ostracoda | | 5501.7 | 8500.4 | 20.98 | 15.3 | 70.0 | 121.2 | 0.91 | 0.2 | 227.5 | 173.2 | 7.10 | 0.4 |
| Acari | | 3614.7 | 6106.6 | 13.79 | 10.0 | 385.7 | 311.6 | 5.01 | 1.1 | 37.0 | 52.3 | 1.15 | 0.1 |
| Oligochaeta | | 1412.7 | 1911.1 | 5.39 | 3.9 | 416.0 | 307.5 | 5.41 | 1.2 | 18.0 | 25.5 | 0.56 | 0.0 |
| Nematoda | | 2481.7 | 4063.1 | 9.47 | 6.9 | 292.0 | 158.3 | 3.80 | 0.8 | 61.5 | 37.5 | 1.92 | 0.1 |
| Hirudinea | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tardigrada | | 6548.3 | 11265.1 | 24.98 | 18.2 | 105.0 | 126.2 | 1.36 | 0.3 | 122.5 | 24.7 | 3.82 | 0.2 |
| Amphipoda | *Talitridae | 126.3 | 199.2 | 0.48 | 0.4 | 36.3 | 55.3 | 0.47 | 0.1 | 87.5 | 37.5 | 2.73 | 0.2 |
| Copepoda | | 1311.3 | 2271.3 | 5.00 | 3.6 | 316.7 | 155.4 | 4.12 | 0.9 | 61.5 | 12.0 | 1.92 | 0.1 |
| Cladocera | | 844.7 | 1425.1 | 3.22 | 2.3 | 58.3 | 53.5 | 0.76 | 0.2 | 61.5 | 12.0 | 1.92 | 0.1 |
| OTHERS | | 29.3 | 25.4 | 0.11 | 0.1 | 15.7 | 17.8 | 0.20 | 0.0 | 13.0 | 12.7 | 0.41 | 0.0 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 26219.0 | 36679.5 | | | 7693.7 | 526.0 | | | 3204.0 | 1381.7 | | |
| MEAN NO. OF MACROFAUNA ONLY | | 680.0 | 904.5 | | | 336.0 | 315.0 | | | 189.0 | 46.7 | | |
| NUMBER OF REPLICATES | | 3 | | | | 3 | | | | 2 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24 b (cont'd.) NECHAKO BENTHIC SITE 11 SAMPLING DATE 06-04-81 GEAR: MUNDIE

| | TAXA | POOL MEAN | POOL S.D | POOL %COMP | POOL %DATE | RIFFLE MEAN | RIFFLE S.D | RIFFLE %COMP | RIFFLE %DATE | RUN MEAN | RUN S.D | RUN %COMP | RUN %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 7221.3 | 4433.2 | 34.66 | 16.6 | 10080.0 | 5085.0 | 50.63 | 17.4 | 6723.3 | 2425.0 | 64.67 | 11.6 |
| | *Simuliidae | 0.0 | 0.0 | 0.0 | 0.0 | 284.7 | 313.4 | 1.43 | 0.5 | 2.7 | 2.3 | 0.03 | 0.0 |
| | *Ceratopogonidae | 861.5 | 978.2 | 4.14 | 2.0 | 2.7 | 2.3 | 0.01 | 0.0 | 13.0 | 22.5 | 0.13 | 0.0 |
| | *Empididae | 327.8 | 498.3 | 1.57 | 0.8 | 46.7 | 40.4 | 0.23 | 0.1 | 1.3 | 2.3 | 0.01 | 0.0 |
| | *Tipulidae | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 2.3 | 0.01 | 0.0 | 23.3 | 40.4 | 0.22 | 0.0 |
| | *Muscidea | 117.0 | 127.5 | 0.56 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ephemeroptera | *Ephemerellidae | 0.0 | 0.0 | 0.0 | 0.0 | 125.3 | 107.5 | 0.63 | 0.2 | 1.3 | 2.3 | 0.01 | 0.0 |
| | *Heptageniidae | 1.5 | 3.0 | 0.01 | 0.0 | 1851.0 | 733.8 | 9.30 | 3.2 | 471.3 | 406.2 | 4.53 | 0.8 |
| | *Baetidae | 100.0 | 171.9 | 0.48 | 0.2 | 938.0 | 934.5 | 4.71 | 1.6 | 11.7 | 20.2 | 0.11 | 0.0 |
| | *Siphonuridae | 116.8 | 233.5 | 0.56 | 0.3 | 3.0 | 5.2 | 0.02 | 0.0 | 23.3 | 40.4 | 0.22 | 0.0 |
| | Caenidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 |
| | Leptophlebiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tricoptera | *Hydroptilidae | 0.0 | 0.0 | 0.0 | 0.0 | 70.0 | 70.0 | 0.35 | 0.1 | 36.3 | 33.0 | 0.35 | 0.1 |
| | *Hydropsychidae | 0.0 | 0.0 | 0.0 | 0.0 | 27.7 | 24.8 | 0.14 | 0.0 | 29.7 | 13.3 | 0.29 | 0.1 |
| | *Leptoceridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 |
| | *Glossosmatidae | 0.0 | 0.0 | 0.0 | 0.0 | 8.7 | 15.0 | 0.04 | 0.0 | 15.0 | 22.6 | 0.14 | 0.0 |
| | *Lepidostomatidae | 1.5 | 3.0 | 0.01 | 0.0 | 24.7 | 42.7 | 0.12 | 0.0 | 27.3 | 19.0 | 0.26 | 0.0 |
| | Psychomyiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Polycentropodidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plecoptera | *Chloroperlidae | 1.5 | 3.0 | 0.01 | 0.0 | 7.3 | 12.7 | 0.04 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 |
| | *Perlodidae | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Nemouridae | 0.0 | 0.0 | 0.0 | 0.0 | 187.0 | 323.9 | 0.94 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Haliplidae | 8.8 | 7.4 | 0.04 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 |
| Hemiptera | *Corixidae | 32.3 | 42.9 | 0.15 | 0.1 | 2.7 | 4.6 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Basommatophora | Lymnaeidae | 469.8 | 881.2 | 2.25 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 26.0 | 41.6 | 0.25 | 0.0 |
| | Planorbidae | 1.5 | 3.0 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 48.7 | 44.0 | 0.47 | 0.1 |
| Mesogastropoda | Valvatidae | 2.8 | 5.5 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.3 | 7.5 | 0.04 | 0.0 |
| Eulamellibranchia | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Heterodonta | Sphaeriidae | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 | 54.0 | 46.8 | 0.52 | 0.1 |
| Ostracoda | | 3222.3 | 1339.3 | 15.47 | 7.4 | 350.0 | 121.2 | 1.76 | 0.6 | 350.3 | 252.9 | 3.37 | 0.6 |
| Acari | | 1040.5 | 1159.5 | 4.99 | 2.4 | 1192.7 | 527.2 | 5.99 | 2.1 | 648.0 | 363.9 | 6.23 | 1.1 |
| Oligochaeta | | 1057.3 | 1016.2 | 5.08 | 2.4 | 4324.3 | 1313.4 | 21.72 | 7.4 | 1309.7 | 475.7 | 12.60 | 2.3 |
| Nematoda | | 511.3 | 617.2 | 2.45 | 1.2 | 303.3 | 145.7 | 1.52 | 0.5 | 480.3 | 323.5 | 4.62 | 0.8 |
| Hirudinea | | 6.0 | 4.9 | 0.03 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tardigrada | | 22.3 | 44.5 | 0.11 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | 44.5 | 30.0 | 0.21 | 0.1 | 2.7 | 2.3 | 0.01 | 0.0 | 43.7 | 44.6 | 0.42 | 0.1 |
| Copepoda | | 4044.3 | 3579.7 | 19.41 | 9.3 | 46.7 | 80.8 | 0.23 | 0.1 | 23.3 | 40.4 | 0.22 | 0.0 |
| Cladocera | | 1480.8 | 1460.9 | 7.11 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHERS | | 139.5 | 138.6 | 0.67 | 0.3 | 24.7 | 39.3 | 0.12 | 0.0 | 23.3 | 40.4 | 0.22 | 0.0 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 20832.3 | 11752.5 | | | 19909.0 | 3678.8 | | | 10396.7 | 3305.0 | | |
| MEAN NO. OF MACROFAUNA ONLY | | 153.3 | 114.0 | | | 148.0 | 51.4 | | | 274.7 | 60.7 | | |
| NUMBER OF REPLICATES | | 4 | | | | 3 | | | | 3 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24 b (cont'd.)

NECHAKO BENTHIC SITE 11 SAMPLING DATE 07-22-81 GEAR: MUNDIE

| TAXA | | POOL MEAN | POOL S.D. | POOL %COMP | POOL %DATE | RIFFLE MEAN | RIFFLE S.D. | RIFFLE %COMP | RIFFLE %DATE | RUN MEAN | RUN S.D. | RUN %COMP | RUN %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 3600.8 | 1681.0 | 17.37 | 8.9 | 9065.0 | 468.5 | 26.60 | 5.7 | 6919.0 | 2928.8 | 46.09 | 12.8 |
| | *Simuliidae | 0.0 | 0.0 | 0.0 | 0.0 | 4343.3 | 5211.5 | 37.69 | 8.0 | 776.3 | 808.4 | 5.17 | 1.4 |
| | *Ceratopogonidae | 114.0 | 130.5 | 0.55 | 0.3 | 1.3 | 2.3 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Empididae | 111.3 | 168.5 | 0.54 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Tipulidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Muscidea | 71.0 | 88.5 | 0.34 | 0.2 | 3.0 | 5.2 | 0.03 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ephemeroptera | *Ephemerellidae | 0.0 | 0.0 | 0.0 | 0.0 | 159.0 | 98.5 | 1.38 | 0.3 | 106.7 | 33.5 | 0.71 | 0.2 |
| | *Heptageniidae | 22.3 | 44.5 | 0.11 | 0.1 | 218.7 | 47.4 | 1.90 | 0.4 | 288.7 | 162.2 | 1.92 | 0.5 |
| | *Baetidae | 44.5 | 89.0 | 0.21 | 0.1 | 704.7 | 378.3 | 6.11 | 1.3 | 179.0 | 168.9 | 1.19 | 0.3 |
| | *Siphonuridae | 14.0 | 17.3 | 0.07 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Caenidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Leptophlebiidae | 0.0 | 0.0 | 0.0 | 0.0 | 46.7 | 80.8 | 0.40 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tricoptera | *Hydroptilidae | 22.3 | 44.5 | 0.11 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Hydropsychidae | 0.0 | 0.0 | 0.0 | 0.0 | 525.0 | 269.0 | 4.56 | 1.0 | 795.7 | 150.1 | 5.30 | 1.5 |
| | *Leptoceridae | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 | 1.3 | 2.3 | 0.01 | 0.0 |
| | *Glossosmatidae | 0.0 | 0.0 | 0.0 | 0.0 | 24.7 | 39.3 | 0.21 | 0.0 | 519.7 | 548.0 | 3.46 | 1.0 |
| | *Lepidostomatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Psychomyiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Polycentropodidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plecoptera | *Chloroperlidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Perlodidae | 0.0 | 0.0 | 0.0 | 0.0 | 261.0 | 175.9 | 2.26 | 0.5 | 176.7 | 84.6 | 1.18 | 0.3 |
| | Nemouridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | 32.3 | 53.4 | 0.16 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Haliplidae | 1.5 | 3.0 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hemiptera | *Corixidae | 47.3 | 33.4 | 0.23 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Basommatophora | Lymnaeidae | 53.0 | 83.7 | 0.26 | 0.1 | 96.0 | 79.7 | 0.83 | 0.2 | 422.7 | 148.8 | 2.82 | 0.8 |
| | Planorbidae | 69.5 | 82.5 | 0.34 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 33.7 | 50.7 | 0.22 | 0.1 |
| Mesogastropoda | Valvatidae | 133.3 | 266.5 | 0.64 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 46.7 | 80.8 | 0.31 | 0.1 |
| Eulamellibranchia | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Heterodonta | Sphaeriidae | 0.0 | 0.0 | 0.0 | 0.0 | 8.7 | 15.0 | 0.08 | 0.0 | 25.0 | 8.9 | 0.17 | 0.0 |
| Ostracoda | | 6600.8 | 4459.2 | 31.83 | 16.2 | 233.7 | 283.5 | 2.03 | 0.4 | 397.0 | 386.1 | 2.64 | 0.7 |
| Acari | | 555.8 | 525.4 | 2.68 | 1.4 | 748.7 | 386.2 | 6.50 | 1.4 | 2385.7 | 1281.4 | 15.89 | 4.4 |
| Oligochaeta | | 539.0 | 456.3 | 2.60 | 1.3 | 683.0 | 589.5 | 5.93 | 1.3 | 799.7 | 451.1 | 5.33 | 1.5 |
| Nematoda | | 267.0 | 178.0 | 1.29 | 0.7 | 256.7 | 145.7 | 2.23 | 0.5 | 467.0 | 225.2 | 3.11 | 0.9 |
| Hirudinea | | 5.8 | 8.0 | 0.03 | 0.0 | 3.0 | 5.2 | 0.03 | 0.0 | 8.7 | 4.5 | 0.06 | 0.0 |
| Tardigrada | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | 191.8 | 251.0 | 0.92 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 24.7 | 39.3 | 0.16 | 0.0 |
| Copepoda | | 3839.3 | 2177.2 | 18.52 | 9.4 | 70.0 | 0.0 | 0.61 | 0.1 | 140.0 | 70.0 | 0.93 | 0.3 |
| Cladocera | | 4200.5 | 2986.7 | 20.26 | 10.3 | 70.0 | 0.0 | 0.61 | 0.1 | 467.0 | 492.2 | 3.11 | 0.9 |
| OTHERS | | 198.5 | 269.8 | 0.96 | 0.5 | 1.3 | 2.3 | 0.01 | 0.0 | 30.0 | 38.9 | 0.20 | 0.1 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 20735.0 | 9149.7 | | | 11524.7 | 5543.5 | | | 15010.7 | 5164.4 | | |
| MEAN NO. OF MACROFAUNA ONLY | | 136.8 | 140.9 | | | 430.3 | 320.6 | | | 810.0 | 456.8 | | |
| NUMBER OF REPLICATES | | 4 | | | | 3 | | | | 3 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24 b (cont'd.) NECHAKO BENTHIC SITE 11 SAMPLING DATE 10-01-81 GEAR: MUNDIE

| TAXA | | POOL MEAN | POOL S.D. | POOL %COMP | POOL %DATE | RIFFLE MEAN | RIFFLE S.D. | RIFFLE %COMP | RIFFLE %DATE | RUN MEAN | RUN S.D. | RUN %COMP | RUN %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 2107.3 | 946.3 | 7.08 | 6.1 | 941.0 | 821.9 | 23.88 | 2.1 | 983.0 | 760.4 | 44.26 | 2.1 |
| | *Simulliidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Ceratopogonidae | 809.0 | 624.6 | 2.72 | 2.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Empididae | 0.0 | 0.0 | 0.0 | 0.0 | 11.7 | 20.2 | 0.30 | 0.0 | 11.7 | 20.2 | 0.53 | 0.0 |
| | *Tipulidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.3 | 9.5 | 0.33 | 0.0 |
| | *Muscidea | 1.5 | 3.0 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ephemeroptera | *Ephemerellidae | 0.0 | 0.0 | 0.0 | 0.0 | 32.0 | 37.0 | 0.81 | 0.1 | 11.0 | 12.1 | 0.50 | 0.0 |
| | *Heptageniidae | 0.0 | 0.0 | 0.0 | 0.0 | 284.3 | 236.5 | 7.22 | 0.6 | 105.3 | 80.4 | 4.74 | 0.2 |
| | *Baetidae | 0.0 | 0.0 | 0.0 | 0.0 | 232.0 | 170.6 | 5.89 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Siphonuridae | 358.5 | 635.4 | 1.21 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.3 | 8.0 | 0.38 | 0.0 |
| | Caenidae | 518.3 | 420.9 | 1.74 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Leptophlebiidae | 85.0 | 97.4 | 0.29 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tricoptera | *Hydroptilidae | 5.8 | 8.0 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 17.0 | 17.5 | 0.77 | 0.0 |
| | *Hydropsychidae | 0.0 | 0.0 | 0.0 | 0.0 | 1849.3 | 1484.5 | 46.93 | 4.0 | 51.3 | 37.2 | 2.31 | 0.1 |
| | *Leptoceridae | 6.0 | 8.5 | 0.02 | 0.0 | 2.7 | 4.6 | 0.07 | 0.0 | 11.0 | 15.7 | 0.50 | 0.0 |
| | *Glossosmatidae | 0.0 | 0.0 | 0.0 | 0.0 | 113.7 | 71.2 | 2.88 | 0.2 | 77.0 | 29.1 | 3.47 | 0.2 |
| | *Lepidostomatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.0 | 2.6 | 0.32 | 0.0 |
| | Psychomyiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 24.7 | 42.7 | 1.11 | 0.1 |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 66.7 | 58.4 | 3.00 | 0.1 |
| | *Polycentropodidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plecoptera | *Chloroperlidae | 0.0 | 0.0 | 0.0 | 0.0 | 140.3 | 159.1 | 3.56 | 0.3 | 106.7 | 89.1 | 4.80 | 0.2 |
| | *Perlodidae | 1.5 | 3.0 | 0.01 | 0.0 | 23.0 | 20.9 | 0.58 | 0.1 | 8.3 | 8.0 | 0.38 | 0.0 |
| | Nemouridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | 7.0 | 8.4 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11.7 | 20.2 | 0.53 | 0.0 |
| | Haliplidae | 107.3 | 91.8 | 0.36 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hemiptera | *Corixidae | 40.5 | 39.9 | 0.14 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 14.3 | 11.1 | 0.65 | 0.0 |
| Basommatophora | Lymnaeidae | 6.0 | 0.0 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 28.7 | 23.7 | 1.29 | 0.1 |
| | Planorbidae | 36.0 | 16.9 | 0.12 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 2.3 | 0.06 | 0.0 |
| Mesogastropoda | Valvatidae | 92.0 | 126.8 | 0.31 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 | 6.9 | 0.18 | 0.0 |
| Eulamellibranchia | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Heterodonta | Sphaeriidae | 483.5 | 497.1 | 1.63 | 1.4 | 1.3 | 2.3 | 0.03 | 0.0 | 3.0 | 5.2 | 0.14 | 0.0 |
| Ostracoda | | 5911.5 | 2886.7 | 19.87 | 17.2 | 4.3 | 7.5 | 0.11 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Acari | | 1312.8 | 1308.6 | 4.41 | 3.8 | 293.3 | 383.4 | 7.44 | 0.6 | 47.3 | 29.5 | 2.13 | 0.1 |
| Oligochaeta | | 4025.8 | 2573.9 | 13.53 | 11.7 | 1.3 | 2.3 | 0.03 | 0.0 | 32.7 | 4.0 | 1.47 | 0.1 |
| Nematoda | | 3870.0 | 1104.8 | 13.01 | 11.3 | 6.0 | 10.4 | 0.15 | 0.0 | 495.3 | 755.6 | 22.30 | 1.1 |
| Hirudinea | | 597.5 | 398.4 | 2.01 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 2.3 | 0.12 | 0.0 |
| Tardigrada | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | 2139.0 | 987.0 | 7.19 | 6.2 | 0.0 | 0.0 | 0.0 | 0.0 | 46.7 | 48.1 | 2.10 | 0.1 |
| Copepoda | | 5311.5 | 985.8 | 17.86 | 15.5 | 0.0 | 0.0 | 0.0 | 0.0 | 7.0 | 6.2 | 0.32 | 0.0 |
| Cladocera | | 1890.5 | 1430.1 | 6.36 | 5.5 | 0.0 | 0.0 | 0.0 | 0.0 | 15.7 | 17.8 | 0.71 | 0.0 |
| OTHERS | | 21.5 | 16.6 | 0.07 | 0.1 | 4.0 | 4.0 | 0.10 | 0.0 | 14.3 | 24.8 | 0.65 | 0.0 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 29745.0 | 11298.8 | | | 3940.3 | 3319.0 | | | 2221.0 | 1350.7 | | |
| MEAN NO. OF MACROFAUNA ONLY | | 1986.5 | 759.6 | | | 156.3 | 223.2 | | | 181.0 | 108.4 | | |
| NUMBER OF REPLICATES | | 4 | | | | 3 | | | | 3 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24 b (cont'd.)

NECHAKO BENTHIC SITE 11 SAMPLING DATE 04-29-81 GEAR: GALEN

| TAXA | | NEARSHORE MEAN | NEARSHORE S.D. | NEARSHORE %COMP | NEARSHORE %DATE | 1/4 CHANNEL MEAN | 1/4 CHANNEL S.D. | 1/4 CHANNEL %COMP | 1/4 CHANNEL %DATE | 1/2 CHANNEL MEAN | 1/2 CHANNEL S.D. | 1/2 CHANNEL %COMP | 1/2 CHANNEL %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 7389.7 | 3151.1 | 79.18 | 27.6 | 11158.0 | 4466.1 | 81.39 | 41.7 | 2701.7 | 270.9 | 72.95 | 10.1 |
| | *Simuliidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11.0 | 19.1 | 0.30 | 0.0 |
| | *Ceratopogonidae | 2.0 | 3.5 | 0.02 | 0.0 | 32.7 | 56.6 | 0.24 | 0.1 | 58.7 | 44.5 | 1.58 | 0.2 |
| | *Empididae | 71.3 | 38.7 | 0.76 | 0.3 | 107.7 | 109.5 | 0.79 | 0.4 | 89.0 | 46.2 | 2.40 | 0.3 |
| | *Tipulidae | 2.0 | 3.5 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Muscidea | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ephemeroptera | *Ephemerellidae | 172.3 | 140.5 | 1.85 | 0.6 | 83.7 | 49.7 | 0.61 | 0.3 | 33.0 | 0.0 | 0.89 | 0.1 |
| | *Heptageniidae | 196.7 | 209.7 | 2.11 | 0.7 | 205.7 | 162.5 | 1.50 | 0.8 | 15.0 | 16.7 | 0.41 | 0.1 |
| | *Baetidae | 40.7 | 35.2 | 0.44 | 0.2 | 34.7 | 54.9 | 0.25 | 0.1 | 2.0 | 3.5 | 0.05 | 0.0 |
| | *Siphonuridae | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 | 10.4 | 0.04 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Caenidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Leptophlebiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tricoptera | *Hydroptilidae | 32.7 | 56.6 | 0.35 | 0.1 | 209.0 | 9.2 | 1.52 | 0.8 | 97.7 | 85.8 | 2.64 | 0.4 |
| | *Hydropsychidae | 89.7 | 46.9 | 0.96 | 0.3 | 215.3 | 94.6 | 1.57 | 0.8 | 19.0 | 17.6 | 0.51 | 0.1 |
| | *Leptoceridae | 34.7 | 54.9 | 0.37 | 0.1 | 152.7 | 164.2 | 1.11 | 0.6 | 25.0 | 17.6 | 0.68 | 0.1 |
| | *Glossosmatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 | 6.9 | 0.11 | 0.0 |
| | *Lepidostomatidae | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 3.5 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Psychomyiidae | 0.0 | 0.0 | 0.0 | 0.0 | 32.7 | 56.6 | 0.24 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 25.7 | 39.4 | 0.69 | 0.1 |
| | *Polycentropodidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plecoptera | *Chloroperlidae | 75.3 | 55.6 | 0.81 | 0.3 | 40.7 | 55.6 | 0.30 | 0.2 | 42.7 | 38.6 | 1.15 | 0.2 |
| | *Perlodidae | 2.0 | 3.5 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Nemouridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Haliplidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11.0 | 19.1 | 0.30 | 0.0 |
| Hemiptera | *Corixidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Basommatophora | Lymnaeidae | 14.0 | 3.5 | 0.15 | 0.1 | 2.0 | 3.5 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Planorbidae | 1.3 | 2.3 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mesogastropoda | Valvatidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Eulamellibranchia | | 97.7 | 169.2 | 1.05 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Heterodonta | Sphaeriidae | 104.7 | 113.7 | 1.12 | 0.4 | 429.0 | 389.8 | 3.13 | 1.6 | 58.7 | 47.5 | 1.58 | 0.2 |
| Ostracoda | | 185.0 | 180.7 | 1.98 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Acari | | 136.0 | 64.6 | 1.46 | 0.5 | 488.0 | 390.0 | 3.56 | 1.8 | 401.0 | 252.7 | 10.83 | 1.5 |
| Oligochaeta | | 594.7 | 774.2 | 6.37 | 2.2 | 304.7 | 110.0 | 2.22 | 1.1 | 54.3 | 18.5 | 1.47 | 0.2 |
| Nematoda | | 52.3 | 47.1 | 0.56 | 0.2 | 132.0 | 228.6 | 0.96 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hirudinea | | 1.3 | 2.3 | 0.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tardigrada | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Copepoda | | 32.7 | 56.6 | 0.35 | 0.1 | 65.3 | 113.2 | 0.48 | 0.2 | 33.0 | 0.0 | 0.89 | 0.1 |
| Cladocera | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHERS | | 4.0 | 6.9 | 0.04 | 0.0 | 8.0 | 13.9 | 0.06 | 0.0 | 21.0 | 16.7 | 0.57 | 0.1 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 9332.7 | 4402.9 | | | 13709.7 | 4619.0 | | | 3703.3 | 216.8 | | |
| MEAN NO. OF MACROFAUNA ONLY | | 989.3 | 927.8 | | | 634.7 | 238.2 | | | 132.7 | 31.8 | | |
| NUMBER OF REPLICATES | | 3 | | | | 3 | | | | 3 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24 b (cont'd.)

NECHAKO BENTHIC SITE 11 SAMPLING DATE 06-04-81 GEAR: GALEN

| | TAXA | NEARSHORE MEAN | S.D. | %COMP | %DATE | 1/4 CHANNEL MEAN | S.D. | %COMP | %DATE | 1/2 CHANNEL MEAN | S.D. | %COMP | %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 4810.7 | 1684.7 | 48.39 | 31.9 | 2202.0 | 1545.3 | 54.84 | 14.6 | 231.0 | 115.7 | 20.15 | 1.5 |
| | *Simuliidae | 32.7 | 56.6 | 0.33 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 8.0 | 8.0 | 0.70 | 0.1 |
| | *Ceratopogonidae | 16.3 | 28.3 | 0.16 | 0.1 | 5.3 | 9.2 | 0.13 | 0.0 | 9.3 | 2.3 | 0.81 | 0.1 |
| | *Empididae | 118.0 | 98.9 | 1.19 | 0.8 | 29.0 | 28.6 | 0.72 | 0.2 | 31.0 | 26.0 | 2.70 | 0.2 |
| | *Tipulidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 | 6.9 | 0.35 | 0.0 |
| | *Muscidea | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ephemeroptera | *Ephemerellidae | 479.3 | 289.8 | 4.82 | 3.2 | 335.0 | 291.3 | 8.34 | 2.2 | 61.0 | 12.5 | 5.32 | 0.4 |
| | *Heptageniidae | 528.0 | 483.3 | 5.31 | 3.5 | 51.0 | 73.3 | 1.27 | 0.3 | 17.3 | 5.0 | 1.51 | 0.1 |
| | *Baetidae | 248.0 | 121.9 | 2.49 | 1.6 | 42.0 | 23.3 | 1.05 | 0.3 | 333.0 | 48.8 | 29.04 | 2.2 |
| | *Siphonuridae | 6.0 | 6.0 | 0.06 | 0.0 | 2.0 | 3.5 | 0.05 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Caenidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Leptophlebiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tricoptera | *Hydroptilidae | 18.3 | 26.7 | 0.18 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 16.0 | 15.1 | 1.40 | 0.1 |
| | *Hydropsychidae | 85.0 | 63.6 | 0.86 | 0.6 | 77.7 | 64.9 | 1.93 | 0.5 | 23.0 | 30.0 | 2.01 | 0.2 |
| | *Leptoceridae | 18.0 | 10.4 | 0.18 | 0.1 | 67.3 | 76.5 | 1.68 | 0.4 | 18.0 | 14.0 | 1.57 | 0.1 |
| | *Glossosmatidae | 4.0 | 6.9 | 0.04 | 0.0 | 30.3 | 22.2 | 0.76 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Lepidostomatidae | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 | 6.0 | 0.15 | 0.0 | 4.7 | 4.2 | 0.41 | 0.0 |
| | Psychomyiidae | 16.3 | 28.3 | 0.16 | 0.1 | 2.0 | 3.5 | 0.05 | 0.0 | 8.7 | 10.3 | 0.76 | 0.1 |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Polycentropodidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 3.5 | 0.17 | 0.0 |
| Plecoptera | *Chloroperlidae | 190.7 | 36.1 | 1.92 | 1.3 | 52.7 | 40.5 | 1.31 | 0.3 | 23.3 | 11.4 | 2.03 | 0.2 |
| | *Perlodidae | 20.3 | 30.2 | 0.20 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 17.7 | 25.6 | 1.54 | 0.1 |
| | Nemouridae | 16.3 | 28.3 | 0.16 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 8.0 | 13.9 | 0.70 | 0.1 |
| Coleoptera | *Dytiscidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Haliplidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hemiptera | *Corixidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Basommatophora | Lymnaeidae | 544.3 | 288.2 | 5.48 | 3.6 | 21.7 | 25.0 | 0.54 | 0.1 | 14.7 | 13.3 | 1.28 | 0.1 |
| | Planorbidae | 4.0 | 6.9 | 0.04 | 0.0 | 4.0 | 6.9 | 0.10 | 0.0 | 2.0 | 3.5 | 0.17 | 0.0 |
| Mesogastropoda | Valvatidae | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 3.5 | 0.05 | 0.0 | 4.0 | 3.5 | 0.35 | 0.0 |
| Eulamellibranchia | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 15.3 | 26.6 | 1.34 | 0.1 |
| Heterodonta | Sphaeriidae | 203.3 | 122.7 | 2.05 | 1.3 | 184.0 | 202.2 | 4.58 | 1.2 | 55.0 | 48.6 | 4.80 | 0.4 |
| Ostracoda | | 195.0 | 84.9 | 1.96 | 1.3 | 40.7 | 14.4 | 1.01 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| Acari | | 863.7 | 171.4 | 8.69 | 5.7 | 375.3 | 205.5 | 9.35 | 2.5 | 184.0 | 145.7 | 16.05 | 1.2 |
| Oligochaeta | | 1162.3 | 579.4 | 11.69 | 7.7 | 310.3 | 203.1 | 7.73 | 2.1 | 20.0 | 10.6 | 1.74 | 0.1 |
| Nematoda | | 211.7 | 156.4 | 2.13 | 1.4 | 135.3 | 187.2 | 3.37 | 0.9 | 30.3 | 22.2 | 2.65 | 0.2 |
| Hirudinea | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tardigrada | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Copepoda | | 130.0 | 74.3 | 1.31 | 0.9 | 16.3 | 28.3 | 0.41 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cladocera | | 16.3 | 28.3 | 0.16 | 0.1 | 2.7 | 4.6 | 0.07 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHERS | | 2.0 | 3.5 | 0.02 | 0.0 | 20.3 | 30.2 | 0.51 | 0.1 | 5.3 | 4.6 | 0.47 | 0.0 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 9940.7 | 2380.4 | | | 4015.0 | 2685.9 | | | 1146.7 | 223.4 | | |
| MEAN NO. OF MACROFAUNA ONLY | | 657.7 | 159.4 | | | 361.7 | 275.8 | | | 181.0 | 39.3 | | |
| NUMBER OF REPLICATES | | 3 | | | | 3 | | | | 3 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24 b (cont'd.) NECHAKO BENTHIC SITE 11 SAMPLING DATE 07-22-81 GEAR: GALEN

| | TAXA | NEARSHORE MEAN | NEARSHORE S.D. | NEARSHORE %COMP | NEARSHORE %DATE | 1/4 CHANNEL MEAN | 1/4 CHANNEL S.D. | 1/4 CHANNEL %COMP | 1/4 CHANNEL %DATE | 1/2 CHANNEL MEAN | 1/2 CHANNEL S.D. | 1/2 CHANNEL %COMP | 1/2 CHANNEL %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | 1761.3 | 1001.1 | 36.39 | 20.5 | 1544.3 | 1052.9 | 47.94 | 18.0 | 176.7 | 70.5 | 33.38 | 2.1 |
| | *Simuliidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Ceratopogonidae | 2.0 | 3.5 | 0.04 | 0.0 | 24.3 | 22.2 | 0.76 | 0.3 | 28.3 | 24.8 | 5.35 | 0.3 |
| | *Empididae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Tipulidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Muscidea | 8.0 | 13.9 | 0.17 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 3.5 | 0.38 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ephemeroptera | *Ephemerellidae | 111.7 | 35.8 | 2.31 | 1.3 | 125.7 | 77.7 | 3.90 | 1.5 | 2.0 | 3.5 | 0.38 | 0.0 |
| | *Heptageniidae | 107.0 | 82.0 | 2.21 | 1.2 | 98.0 | 87.8 | 3.04 | 1.1 | 2.0 | 3.5 | 0.38 | 0.0 |
| | *Baetidae | 81.0 | 98.7 | 1.67 | 0.9 | 69.0 | 63.4 | 2.14 | 0.8 | 46.7 | 24.7 | 8.82 | 0.5 |
| | *Siphonuridae | 18.0 | 10.4 | 0.37 | 0.2 | 2.0 | 3.5 | 0.06 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Caenidae | 68.7 | 36.3 | 1.42 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Leptophlebiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tricoptera | *Hydroptilidae | 2.0 | 3.5 | 0.04 | 0.0 | 8.0 | 9.2 | 0.25 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Hydropsychidae | 28.3 | 39.1 | 0.59 | 0.3 | 42.7 | 37.9 | 1.32 | 0.5 | 22.3 | 13.1 | 4.22 | 0.3 |
| | *Leptoceridae | 6.0 | 10.4 | 0.12 | 0.1 | 6.0 | 6.0 | 0.19 | 0.1 | 2.0 | 3.5 | 0.38 | 0.0 |
| | *Glossosmatidae | 0.0 | 0.0 | 0.0 | 0.0 | 7.0 | 6.2 | 0.22 | 0.1 | 95.3 | 44.0 | 18.01 | 1.1 |
| | *Lepidostomatidae | 10.0 | 12.5 | 0.21 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Psychomyiidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Rhyacophilidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Polycentropodidae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plecoptera | *Chloroperlidae | 0.0 | 0.0 | 0.0 | 0.0 | 9.0 | 9.0 | 0.28 | 0.1 | 2.0 | 3.5 | 0.38 | 0.0 |
| | *Perlodidae | 6.0 | 10.4 | 0.12 | 0.1 | 56.0 | 57.2 | 1.74 | 0.7 | 6.0 | 10.4 | 1.13 | 0.1 |
| | Nemouridae | 16.3 | 28.3 | 0.34 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | 16.3 | 28.3 | 0.34 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Haliplidae | 20.0 | 17.3 | 0.41 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hemiptera | *Corixidae | 0.0 | 0.0 | 0.0 | 0.0 | 16.3 | 28.3 | 0.51 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| Basommatophora | Lymnaeidae | 185.7 | 65.4 | 3.84 | 2.2 | 118.0 | 163.8 | 3.66 | 1.4 | 2.0 | 3.5 | 0.38 | 0.0 |
| | Planorbidae | 56.7 | 46.6 | 1.17 | 0.7 | 4.0 | 3.5 | 0.12 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mesogastropoda | Valvatidae | 12.0 | 15.9 | 0.25 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Eulamellibranchia | | 6.0 | 10.4 | 0.12 | 0.1 | 109.3 | 189.4 | 3.39 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| Heterodonta | Sphaeriidae | 713.0 | 469.8 | 14.73 | 8.3 | 284.3 | 292.8 | 8.83 | 3.3 | 4.0 | 3.5 | 0.76 | 0.0 |
| Ostracoda | | 243.7 | 135.7 | 5.03 | 2.8 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 3.5 | 0.38 | 0.0 |
| Acari | | 189.0 | 121.6 | 3.91 | 2.2 | 404.7 | 493.9 | 12.56 | 4.7 | 89.3 | 24.8 | 16.88 | 1.0 |
| Oligochaeta | | 854.7 | 636.4 | 17.66 | 9.9 | 179.3 | 129.6 | 5.57 | 2.1 | 34.7 | 27.6 | 6.55 | 0.4 |
| Nematoda | | 50.7 | 46.1 | 1.05 | 0.6 | 69.3 | 114.9 | 2.15 | 0.8 | 6.0 | 10.4 | 1.13 | 0.1 |
| Hirudinea | | 85.0 | 76.2 | 1.76 | 1.0 | 2.0 | 3.5 | 0.06 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tardigrada | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Copepoda | | 105.7 | 92.4 | 2.18 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 3.5 | 0.38 | 0.0 |
| Cladocera | | 73.0 | 106.3 | 1.51 | 0.8 | 16.3 | 28.3 | 0.51 | 0.2 | 4.0 | 3.5 | 0.76 | 0.0 |
| OTHERS | | 2.0 | 3.5 | 0.04 | 0.0 | 25.7 | 21.7 | 0.80 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | 4839.7 | 2483.0 | | | 3221.3 | 2295.0 | | | 529.3 | 164.6 | | |
| MEAN NO. OF MACROFAUNA ONLY | | 490.3 | 243.6 | | | 364.3 | 127.9 | | | 46.3 | 29.9 | | |
| NUMBER OF REPLICATES | | 3 | | | | 3 | | | | 3 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 24 b (cont'd.) NECHAKO BENTHIC SITE 11 SAMPLING DATE 10-02-81 GEAR: GALEN

| | TAXA | NEARSHORE MEAN | S.D. | %COMP | %DATE | 1/4 CHANNEL MEAN | S.D. | %COMP | %DATE | 1/2 CHANNEL MEAN | S.D. | %COMP | %DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diptera | *Chironomidae | | | | | 3227.7 | 2239.8 | 40.88 | 33.6 | 282.3 | 132.1 | 16.51 | 2.9 |
| | *Simuliidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Ceratopogonidae | | | | | 105.7 | 78.3 | 1.34 | 1.1 | 402.7 | 151.4 | 23.55 | 4.2 |
| | *Empididae | | | | | 130.0 | 74.3 | 1.65 | 1.4 | 4.0 | 6.9 | 0.23 | 0.0 |
| | *Tipulidae | | | | | 26.3 | 27.6 | 0.33 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Muscidea | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Ephemeroptera | *Ephemerellidae | | | | | 540.0 | 310.8 | 6.84 | 5.6 | 56.7 | 30.7 | 3.31 | 0.6 |
| | *Heptagenidae | | | | | 524.3 | 476.2 | 6.64 | 5.5 | 152.3 | 106.6 | 8.91 | 1.6 |
| | *Baetidae | | | | | 292.7 | 195.0 | 3.71 | 3.0 | 77.3 | 33.6 | 4.52 | 0.8 |
| | *Siphonuridae | | | | | 6.0 | 6.0 | 0.08 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Caenidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Leptophlebiidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Unknown | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tricoptera | *Hydroptilidae | | | | | 249.7 | 106.2 | 3.16 | 2.6 | 14.3 | 24.8 | 0.84 | 0.1 |
| | *Hydropsychidae | | | | | 265.7 | 232.7 | 3.36 | 2.8 | 56.7 | 59.4 | 3.31 | 0.6 |
| | *Leptoceridae | | | | | 118.0 | 103.9 | 1.49 | 1.2 | 4.0 | 6.9 | 0.23 | 0.0 |
| | *Glossosmatidae | | | | | 225.7 | 157.7 | 2.86 | 2.3 | 79.3 | 48.8 | 4.64 | 0.8 |
| | *Lepidostomatidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Psychomyiidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Rhyacophilidae | Sample site not wetted. | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Polycentropodidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Plecoptera | *Chloroperlidae | | | | | 383.7 | 223.1 | 4.86 | 4.0 | 258.0 | 97.4 | 15.09 | 2.7 |
| | *Perlodidae | | | | | 91.3 | 62.9 | 1.16 | 1.0 | 36.3 | 42.6 | 2.12 | 0.4 |
| | Nemouridae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Coleoptera | *Dytiscidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | *Haliplidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hemiptera | *Corixidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Basommatophora | Lymnaeidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Planorbidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mesogastropoda | Valvatidae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Eulamellibranchia | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Heterodonta | Sphaeriidae | | | | | 138.0 | 134.2 | 1.75 | 1.4 | 2.0 | 3.5 | 0.12 | 0.0 |
| Ostracoda | | | | | | 49.0 | 49.0 | 0.62 | 0.5 | 6.0 | 6.0 | 0.35 | 0.1 |
| Acari | | | | | | 1081.0 | 791.5 | 13.69 | 11.3 | 213.3 | 159.2 | 12.48 | 2.2 |
| Oligochaeta | | | | | | 231.7 | 181.2 | 2.93 | 2.4 | 30.3 | 16.1 | 1.77 | 0.3 |
| Nematoda | | | | | | 187.0 | 218.6 | 2.37 | 1.9 | 26.3 | 45.6 | 1.54 | 0.3 |
| Hirudinea | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tardigrada | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Amphipoda | *Talitridae | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Copepoda | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cladocera | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OTHERS | | | | | | 22.0 | 3.5 | 0.28 | 0.2 | 8.0 | 6.9 | 0.47 | 0.1 |
| MEAN NO. OF FAUNA (MACRO PLUS MICRO) | | | | | | 7895.3 | 4922.9 | | | 1710.0 | 392.0 | | |
| MEAN NO. OF MACROFAUNA ONLY | | | | | | 368.7 | 211.9 | | | 151.0 | 36.8 | | |
| NUMBER OF REPLICATES | | | | | | 3 | | | | 3 | | | |

* INDICATES TAXA FOUND IN CHINOOK STOMACHS APRIL-OCTOBER 1981

Appendix 25. Water temperature, velocity[a] and depth in different habitats sampled for benthos at sites No. 3 and No. 11, Nechako River, April - Sept./Oct. 1981.

SITE No. 3

| Date | Pool | | | Riffle | | | Run | | |
|---|---|---|---|---|---|---|---|---|---|
| | Temp. (°C) | Velocity (m/sec) | Depth (m) | Temp. (°C) | Velocity (m/sec) | Depth (m) | Temp. (°C) | Velocity (m/sec) | Depth (m) |
| Apr. 27 | 4.0 | < 0.03 | 0.34 | 3.0 | 0.70 | 0.30 | 3.0 | 0.42 | 0.30 |
| June 3 | 14.0 | < 0.03 | 0.34 | 12.0 | 0.70 | 0.30 | 12.0 | 0.42 | 0.30 |
| July 20 | 20.0 | < 0.03 | 0.34 | 18.0 | 0.70 | 0.30 | 18.0 | 0.42 | 0.30 |
| Sept. 29 | 9.0 | < 0.03 | 0.15 | - | - | - | - | - | - |
| | Nearshore | | | 1/4 Channel | | | Mid-channel | | |
| Apr. 26 | 3.0 | 0.52 | 0.80 | 3.0 | 0.61 | 1.83 | 3.0 | 0.73 | 1.74 |
| June 3 | 12.0 | 0.52 | 0.80 | 12.0 | 0.61 | 1.83 | 12.0 | 0.73 | 1.74 |
| July 21 | 19.0 | 0.52 | 0.80 | 19.0 | 0.61 | 1.83 | 19.0 | 0.73 | 1.74 |
| Sept. 30 | - | - | - | 8.0 | 0.43 | 1.48 | 8.0 | 0.30 | 1.00 |

SITE No. 11

| | Pool | | | Riffle | | | Run | | |
|---|---|---|---|---|---|---|---|---|---|
| Apr. 28 | 8.0 | < 0.03 | 0.30 | 6.0 | 0.67 | 0.46 | 6.0 | 0.30 | 0.45 |
| June 4 | 14.0 | < 0.03 | 0.30 | 14.0 | 0.67 | 0.40 | 14.0 | 0.30 | 0.40 |
| July 22 | 20.0 | < 0.03 | 0.30 | 19.0 | 0.67 | 0.40 | 19.0 | 0.30 | 0.40 |
| Oct. 1 | 10.0 | < 0.03 | 0.13 | 9.0 | 0.20 | 0.10 | 9.0 | 0.12 | 0.10 |
| | Nearshore | | | 1/4 Channel | | | Mid-channel | | |
| Apr. 29 | 3.0 | 0.64 | 0.64 | 3.0 | 0.64 | 1.34 | 3.0 | 0.76 | 1.28 |
| June 4 | 12.0 | 0.64 | 0.64 | 12.0 | 0.64 | 1.34 | 12.0 | 0.76 | 1.28 |
| July 22 | 19.0 | 0.64 | 0.64 | 19.0 | 0.64 | 1.34 | 19.0 | 0.76 | 1.28 |
| Oct. 2 | - | - | - | 8.0 | 0.45 | 1.06 | 8.0 | 0.52 | 1.00 |

[a] At 12 cm "nose" height from substrate.

Appendix 26. Substrate analysis by habitat type at benthic sites No. 3 and No. 11, Nechako River, April 23 & 24, 1982.

| Sieve No. | Mesh size (mm) | SITE No. 3 | | | | | | SITE No. 11 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Run Rep. 1 | | Run Rep. 2 | | Riffle | | Pool | | Nearshore | |
| | | Volume[a] (ml) | % of sample | Volume[a] (ml) | % of sample | Volume[a] (ml) | % of sample | Volume[a] (ml) | % of sample | Volume[a] (ml) | % of sample |
| 1 | 38.1 | 1840 | 49.7 | 3170 | 64.2 | 1750 | 55.5 | 50 | 9.3 | 1785 | 66.6 |
| 2 | 16 | 870 | 23.5 | 1040 | 21.1 | 525 | 16.6 | 190 | 35.2 | 380 | 14.2 |
| 3 | 9.5 | 245 | 6.6 | 170 | 3.4 | 260 | 8.2 | 60 | 11.1 | 160 | 6.0 |
| 4 | 4.75 | 225 | 6.1 | 170 | 3.4 | 175 | 5.5 | 50 | 9.3 | 135 | 5.0 |
| 5 | 2 | 125 | 3.4 | 110 | 2.2 | 120 | 3.8 | 45 | 8.3 | 100 | 3.7 |
| 6 | 1 | 60 | 1.6 | 80 | 1.6 | 80 | 2.5 | 25 | 4.6 | 45 | 1.7 |
| 7 | 0.500 | 165 | 4.4 | 110 | 2.2 | 100 | 3.2 | 20 | 3.7 | 30 | 1.1 |
| 8 | 0.250 | 125 | 3.4 | 55 | 1.1 | 105 | 3.3 | 15 | 2.8 | 20 | 0.7 |
| 9 | 0.125 | 50 | 1.3 | 25 | 0.5 | 45 | 1.4 | 65 | 12.1 | 20 | 0.7 |
| 10 | 0.063 | 1 | ~0 | 5 | 0.1 | 0.1 | ~0 | 11 | 2.0 | 3 | 0.1 |
| | | 0.2 | ~0 | 5 | 0.1 | 0.3 | ~0 | 8 | 1.5 | 2 | 0.1 |
| Total | | 3706.2 | 100 | 4940 | 100 | 3160.4 | 100 | 539 | 100 | 2680 | 100 |

[a] Volume of water displaced.

Appendix 27. Abundance of drift organisms (No./$m^3$) by site, Nechako River, June - August 1980.

| Site | | June 28 | | July 16-19 | | | | August 8-9 |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 5 | 1 | 3 | 5A | 11 | 3 |
| TAXA | | | | | | | | |
| Ephemeroptera | subimago | | | 1 | | | | |
| Baetidae | nymph | | 3 | | | 2 | 1 | 2 |
| Ephemerellidae | nymph | 2 | | | | | | |
| Coleoptera | | | | | | | | |
| Haliplidae | larvae | | | | | | | 1 |
| Diptera | | | | | | | | |
| Chironomidae | larvae | 34 | 39 | 15 | 46 | 9 | 13 | 19 |
| | pupae | | | 1 | 1 | | | |
| | emerging adults | | | 3 | 3 | 1 | | |
| Simuliidae | larvae | | 1 | 11 | 1 | | | |
| Tipulidae | larvae | | 1 | | | | | |
| Hemiptera | | 1 | | | | | | |
| Oligochaeta | | 1 | 1 | 2 | 1 | 1 | | |
| Naididae | adult | | | | | | | 6 |
| Cnidaria | | | | | | | | |
| Hydridae | | | | | | | | 1 |
| Nematoda | | 1 | 1 | | | | | |
| Hydracarina | | | | | 1 | | | |
| Copepoda | | | | 521 | 1 | | | |
| Calanoida | | | | | | | | 13 |
| Cyclopoida | | | | | | | | 1 |
| Cladocera | | | | | 1 | | | |
| Hydrozoa | | | | 6 | | 1 | | |
| Egg masses | | | | 2 | | | | |
| Total No. organisms | | 39 | 46 | 562 | 55 | 14 | 14 | 47 |
| Total No. taxa | | 5 | 6 | 7 | 6 | 4 | 2 | 10 |

Appendix 28. Abundance of drift organisms (No./100 $m^3$) in ripple habitats at sites No. 3 and No. 11, Nechako River, April - October 1981.

SITE No. 3

| | TAXA | Density per replicate 1 | 2 | 3[a] | Mean | Density per life stage Larva | Pupa | Nymph | Adult |
|---|---|---|---|---|---|---|---|---|---|
| April 28 | Diptera | 154 | 648 | - | 401 | 286 | 54 | 0 | 462 |
| | Copepoda | 2147 | 1752 | - | 1950 | 0 | 0 | 0 | 3899 |
| | Trichoptera | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | 0 | 15 | - | 15 | 0 | 0 | 15 | 0 |
| | Other | 1 | 23 | - | 12 | 0 | 0 | 0 | 24 |
| | Total | 2302 | 2438 | - | 2378 | 286 | 54 | 15 | 4385 |
| | Mean length (mm) | 2.2 | - | - | 2.2 | 2.6 | 2.0 | 0 | 1.8 |
| June 3 | Diptera | 423 | 232 | - | 328 | 651 | 4 | 0 | 0 |
| | Copepoda | 26 | 31 | - | 29 | 0 | 0 | 0 | 57 |
| | Trichoptera | 4 | 0 | - | 4 | 4 | 0 | 0 | 0 |
| | Ephemeroptera | 9 | 8 | - | 8 | 0 | 0 | 17 | 0 |
| | Other | 30 | 23 | - | 27 | 0 | 0 | 4 | 49 |
| | Total | 492 | 294 | - | 397 | 655 | 4 | 21 | 106 |
| | Mean length (mm) | - | 1.2 | - | 1.2 | 1.8 | 1.5 | 0.8 | 0.5 |
| July 20 | Diptera | 310 | 168 | 3177 | 1218 | 963 | 344 | 0 | 2348 |
| | Copepoda | 0 | 13 | 2 | 8 | 0 | 0 | 0 | 15 |
| | Trichoptera | 8 | 5 | 544 | 186 | 67 | 11 | 0 | 479 |
| | Ephemeroptera | 5 | 16 | 557 | 193 | 0 | 0 | 415 | 163 |
| | Other | 53 | 18 | 303 | 125 | 87 | 0 | 91 | 196 |
| | Total | 376 | 220 | 4583 | 1730 | 1117 | 355 | 506 | 3201 |
| | Mean length (mm) | - | 2.0 | - | 2.0 | 2.7 | 2.0 | 2.2 | 0.9 |
| Sept. 29 | Diptera | 2435 | 1313 | - | 1874 | 3548 | 0 | 0 | 200 |
| | Copepoda | 106 | 17 | - | 62 | 0 | 0 | 0 | 123 |
| | Trichoptera | 225 | 52 | - | 139 | 277 | 0 | 0 | 0 |
| | Ephemeroptera | 179 | 54 | - | 117 | 0 | 0 | 233 | 0 |
| | Other | 92 | 67 | - | 80 | 0 | 0 | 1 | 158 |
| | Total | 3037 | 1503 | - | 2272 | 3825 | 0 | 234 | 481 |
| | Mean length (mm) | - | - | - | - | - | - | - | - |

Appendix 28 (Cont'd.)

SITE No. 11

| | TAXA | Density per replicate 1 | 2 | 3[a] | Mean | Density per life stage Larva | Pupa | Nymph | Adult |
|---|---|---|---|---|---|---|---|---|---|
| April 29 | Diptera | 108 | 49 | 379 | 179 | 152 | 380 | 0 | 4 |
| | Copepoda | 356 | 179 | 700 | 412 | 0 | 0 | 0 | 1235 |
| | Trichoptera | 0 | 0 | 8 | 8 | 8 | 0 | 0 | 0 |
| | Ephemeroptera | 30 | 24 | 0 | 27 | 0 | 0 | 54 | 0 |
| | Other | 36 | 21 | 45 | 34 | 18 | 0 | 0 | 84 |
| | Total | 530 | 273 | 1132 | 660 | 178 | 380 | 54 | 1323 |
| | Mean length (mm) | - | 3.0 | - | 3.0 | 2.6 | - | 8.5 | 1.6 |
| June 5 | Diptera | 187 | 162 | - | 175 | 321 | 25 | 0 | 3 |
| | Copepoda | 0 | 17 | - | 17 | 0 | 0 | 0 | 17 |
| | Trichoptera | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | 5 | 14 | - | 10 | 0 | 0 | 19 | 0 |
| | Other | 16 | 101 | - | 59 | 0 | 0 | 0 | 117 |
| | Total | 208 | 294 | - | 261 | 321 | 25 | 19 | 137 |
| | Mean length (mm) | 1.9 | - | - | 1.9 | 2.8 | 2.0 | 0.4 | 0.7 |
| Oct. 2 | Diptera | 1646 | 1466 | - | 1556 | 3111 | 1 | 0 | 0 |
| | Copepoda | 2 | 3 | - | 3 | 0 | 0 | 0 | 5 |
| | Trichoptera | 16 | 1 | - | 9 | 17 | 0 | 0 | 0 |
| | Ephemeroptera | 9 | 8 | - | 9 | 0 | 0 | 17 | 0 |
| | Other | 113 | 78 | - | 96 | 2 | 0 | 9 | 180 |
| | Total | 1786 | 1556 | - | 1673 | 3130 | 1 | 26 | 185 |
| | Mean length (mm) | - | 1.3 | - | 1.3 | 2.8 | 2.0 | 1.8 | 0.2 |

[a] No data collected since sampler malfunctioned.

Appendix 29. Total length (km) of wetted side channels in each class at different discharges in four reaches of Nechako River between Cheslatta Falls and Fort Fraser, 1982.

| River reach[a] and length (km) | | 1 (10.6 km) | | | | 2 (22.2 km) | | | | 3 (40.7 km) | | | | 4 (9.0 km) | | | | Total (82.6 km) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Class of side channel[b] | | 1 | 1B | 2 | 2B | 1 | 1B | 2 | 2B | 1 | 1B | 2 | 2B | 1 | 1B | 2 | 2B | 1 | 1B | 2 | 2B |
| Discharge | | | | | | | | | | | | | | | | | | | | | |
| $m^3$/sec | cfs | | | | | | | | | | | | | | | | | | | | |
| 11.6 | 410 | 0.45 | 0 | 0.10 | 0 | 1.19 | 1.43 | 1.14 | 0.63 | 0 | 1.79 | 0.23 | 0.37 | 0.90 | 0.68 | 0.05 | 0.23 | 2.54 | 3.90 | 1.52 | 1.23 |
| 25.2 | 890 | 1.16 | 0 | 0.23 | 0 | 2.85 | 1.14 | 1.40 | 0.76 | 0.80 | 3.11 | 0.60 | 0.42 | 2.83 | 0 | 0.14 | 0.23 | 7.64 | 4.25 | 2.37 | 1.41 |
| 56.6 | 2,000 | 1.72 | 0 | 0.37 | 0 | 3.64 | 0.72 | 1.82 | 0.37 | 5.33 | 0.45 | 1.45 | 0.11 | 3.43 | 0.10 | 0.85 | 0 | 14.12 | 1.27 | 4.49 | 0.48 |

[a] See Fig. 1 for location;
Reach No. 1 - Cheslatta Falls to Irvine's Lodge;
Reach No. 2 - Irvine's Lodge to Greer Cr.;
Reach No. 3 - Greer Cr. to site No. 11;
Reach No. 4 - Site No. 11 - Fort Fraser.

Total ——— Cheslatta Falls to Fort Fraser.

[b] See text.

Appendix 30. Distribution of chinook spawners in Nechako River sections (1-16, Fig. 32) from Cheslatta Falls to Vanderhoof, September 1980.

| Section No. | Number of fish | | | | |
|---|---|---|---|---|---|
| | September 2 | September 9 | September 16 | September 23 | Mean September 2, 9 & 16 |
| 1 | 13 | 37 | 30 | 21 | 27 |
| 2 | 120 | 52 | 202 | 84 | 125 |
| 3 | 135 | 298 | 563 | 70 | 332 |
| 4 | 23 | 168 | 200 | 459 | 130 |
| 5 | 23 | 162 | 145 | 176 | 110 |
| 6 | 46 | 192 | 139 | 41 | 126 |
| 7 | 1 | 3 | 1 | 100 | 2 |
| 8 | 14 | 6 | 21 | 8 | 14 |
| 9 | 1 | 33 | 14 | 0 | 16 |
| 10 | 137 | 51 | 17 | 0 | 68 |
| 11 | 222 | 116 | 3 | 76 | 114 |
| 12 | 125 | 84 | 49 | 79 | 86 |
| 13 | 15 | 16 | 28 | 0 | 20 |
| 14 | 6 | 61 | 26 | 1 | 31 |
| 15 | 2 | 82 | 39 | 74 | 41 |
| 16 | 15 | 77 | 31 | 0 | 41 |
| Total | 898 | 1438 | 1508 | 1189 | 1283 |

Appendix 31. Length (postorbital - hypural), weight, sex and age of Nechako chinook spawners, September 1980.

| Date | Length (cm) | Weight (kg) | Sex | Age | Date | Length (cm) | Sex | Age |
|---|---|---|---|---|---|---|---|---|
| Sept. 11 | 59.5 | 4.8 | M | $4_2$ | Sept. 20 | 71.5 | F | $4_1$ |
| | 71.5 | 6.4 | F | $5_2$ | | 75.5 | F | $4_1$ |
| | 74.0 | 7.7 | M | $5_2$ | | 71.0 | F | $5_2$ |
| | 59.5 | 7.2 | M | $5_2$ | | 71.5 | F | R |
| | 73.0 | 5.5 | F | $5_2$ | | 79.0 | M | $5_2$ |
| Sept. 14 | 75.5 | 6.4 | F | $5_2$ | | 79.0 | F | $5_2$ |
| | 72.5 | 6.4 | F | $4_1$ | | 74.0 | F | $5_2$ |
| | 69.0 | 4.5 | F | $5_2$ | Sept. 21 | 73.0 | F | $5_2$ |
| | 75.0 | 6.8 | F | $5_2$ | | 70.0 | F | $5_2$ |
| | 75.5 | 6.4 | F | $5_2$ | | 68.5 | F | $4_1$ |
| | 68.0 | 5.0 | F | $4_1$ | | 57.0 | F | $5_2$ |
| Sept. 15 | 71.0 | 5.5 | F | $5_2$ | | 70.0 | M | $5_2$ |
| Sept. 17 | 71.0 | 5.0 | F | R | | 72.5 | F | $5_2$ |
| | 68.5 | 5.5 | F | $5_2$ | | 75.0 | F | $5_2$ |
| | 66.0 | 4.5 | F | $5_2$ | | 61.0 | M | $5_2$ |
| | 62.0 | 2.7 | F | $4_2$ | | 81.5 | M | $5_2$ |
| | 81.0 | 8.2 | M | R | | 75.0 | F | $5_2$ |
| | 59.5 | 3.6 | F | R | | 71.5 | F | $5_2$ |
| Sept. 18 | 84.5 | 11.8 | M | $5_1$ | | 74.0 | M | $5_2$ |
| | 73.0 | 8.6 | M | $5_2$ | | 75.5 | F | $5_2$ |
| | 76.0 | 8.6 | M | $5_2$ | | 71.0 | F | $5_2$ |
| | 75.0 | | M | $5_2$ | | 73.0 | F | $5_2$ |
| | 85.0 | | M | $5_1$ | | 77.0 | M | $4_1$ |
| | 77.0 | | M | $5_2$ | | 72.0 | F | R |
| | 81.0 | | F | $5_2$ | | 72.0 | M | R |
| | 77.0 | | F | $5_2$ | | 63.0 | F | $4_2$ |
| | 41.0 | | M | $3_2$ | | 72.0 | M | $5_2$ |
| | 68.0 | | F | $4_1$ | | 68.5 | M | $4_1$ |
| | 67.0 | | F | $4_1$ | | 78.0 | M | $5_2$ |
| | 80.0 | | M | $5_2$ | | 71.0 | F | $5_2$ |
| | 69.0 | | F | $5_2$ | | 73.0 | M | $5_2$ |
| | 74.0 | | F | R | | 71.0 | F | $5_2$ |
| | 77.0 | | M | $5_2$ | Sept. 23 | 69.0 | M | $5_2$ |
| | 64.0 | | M | R | | 76.0 | M | $5_2$ |
| | 75.0 | | F | $5_2$ | | 59.0 | F | $4_2$ |
| | 69.0 | | F | $5_2$ | | 72.0 | F | $5_2$ |
| Sept. 19 | 69.0 | | F | $4_1$ | | 65.0 | M | $4_2$ |
| | 74.5 | | F | $4_1$ | | 82.0 | M | $5_2$ |
| | 75.0 | | F | $5_2$ | | 65.0 | F | $5_2$ |
| | 85.5 | | M | R | | 80.0 | F | $5_2$ |
| | 70.5 | | F | $5_2$ | | 82.0 | M | $5_2$ |
| | 72.5 | | F | $5_2$ | | 75.0 | F | $5_2$ |
| | 73.5 | | F | $5_2$ | | 70.0 | F | $5_2$ |
| | 73.0 | | F | $5_2$ | | 80.0 | M | $5_2$ |
| | 66.5 | | M | $5_2$ | | 72.0 | F | $5_2$ |
| | 67.5 | | F | $5_2$ | | 75.0 | F | R |
| | | | | | | 71.0 | F | R |

Appendix 31. (Cont'd.)

| Date | Length (cm) | Sex | Age | Date | Length (cm) | Sex | Age | Date | Length (cm) | Sex | Age | Date | Length (cm) | Sex | Age |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sept. 25 | 80.0 | M | $5_2$ | Sept. 26 | 74.0 | M | $5_2$ | Sept. 28 | 68.0 | M | $5_2$ | Sept. 28 | 33.0 | M | $3_2$ |
| | 72.0 | M | $5_2$ | | 73.0 | F | $5_2$ | | 72.0 | M | $5_2$ | | 72.0 | F | $5_2$ |
| | 81.0 | M | $5_2$ | | 82.0 | M | $5_2$ | | 78.0 | F | $4_2$ | | 74.0 | F | $5_2$ |
| | 64.0 | M | R | | 71.0 | M | $5_2$ | | 63.0 | F | $5_2$ | | 81.0 | M | $5_2$ |
| | 59.0 | M | $4_2$ | | 73.0 | M | $5_2$ | | 75.0 | F | $4_2$ | | 72.0 | F | $4_1$ |
| | 82.0 | M | $5_2$ | | 74.0 | M | $5_2$ | | 79.0 | F | R | | 79.0 | M | $5_2$ |
| | 70.0 | M | $5_2$ | | 67.0 | F | $4_2$ | | 70.0 | F | $5_2$ | | 63.0 | M | $4_2$ |
| | 72.0 | M | $4_1$ | | 69.0 | F | $5_2$ | | 76.0 | F | $5_2$ | | 65.0 | F | $5_2$ |
| | 50.0 | M | $4_2$ | | 72.0 | M | R | | 77.0 | F | $5_2$ | | 76.0 | F | $5_2$ |
| | 82.0 | M | R | | 74.0 | F | $5_2$ | | 78.0 | F | $5_2$ | | 80.0 | M | R |
| Sept. 26 | 75.0 | F | $5_2$ | | 76.0 | F | $5_2$ | | 71.0 | F | R | | 79.0 | F | $5_2$ |
| | 68.0 | M | $5_2$ | | 68.0 | F | $5_2$ | | 82.0 | M | $3_1$ | | | | |
| | 71.0 | F | $5_2$ | | 76.0 | M | $5_2$ | | 80.0 | M | $5_2$ | | | | |
| | 71.0 | F | $5_2$ | | 69.0 | M | $4_1$ | | 62.0 | F | $5_2$ | | | | |
| | 70.0 | F | $5_2$ | | 75.0 | F | $5_2$ | | 65.0 | F | $5_2$ | | | | |
| | 75.0 | F | $5_2$ | | 72.0 | F | $5_2$ | | 48.0 | M | $5_2$ | | | | |
| | 69.0 | F | $4_2$ | | 80.0 | M | $5_2$ | | 69.0 | F | $5_2$ | | | | |
| | 72.0 | F | $5_2$ | | 71.0 | F | $5_2$ | | 75.0 | M | $4_1$ | | | | |
| | 69.0 | F | R | Sept. 28 | 68.0 | F | $5_2$ | | 78.0 | F | $5_2$ | | | | |
| | 75.0 | F | $5_2$ | | 70.0 | F | $4_2$ | | 72.0 | F | $5_2$ | | | | |
| | 72.0 | F | $5_2$ | | 72.0 | F | R | | 77.0 | M | $4_1$ | | | | |
| | 71.0 | M | $4_1$ | | 66.0 | M | $5_2$ | | 62.0 | M | $4_2$ | | | | |
| | 69.0 | F | $5_2$ | | 63.0 | M | $5_2$ | | 75.0 | F | $5_2$ | | | | |
| | 61.0 | M | $4_2$ | | 74.0 | F | $5_2$ | | 73.0 | F | $5_2$ | | | | |
| | 75.0 | F | $4_1$ | | 72.0 | F | $5_2$ | | 67.0 | F | $5_2$ | | | | |
| | 74.0 | F | $5_2$ | | 69.0 | F | $5_2$ | | 65.0 | F | $4_2$ | | | | |
| | 70.0 | F | $4_2$ | | 75.0 | M | $5_2$ | | 74.0 | F | $4_1$ | | | | |
| | 73.0 | F | $5_2$ | | 72.0 | M | $5_2$ | | 75.0 | F | $5_2$ | | | | |
| | 71.0 | F | $5_2$ | | 61.0 | F | $5_2$ | | 62.0 | F | $4_2$ | | | | |
| | 72.0 | F | $5_2$ | | 71.0 | F | $5_2$ | | 77.0 | F | $5_2$ | | | | |
| | 76.0 | F | $5_2$ | | 71.0 | F | R | | 72.0 | F | $5_2$ | | | | |
| | 63.0 | M | $4_2$ | | 72.0 | F | $4_2$ | | 60.0 | F | $4_2$ | | | | |

[a] R indicates resorbed scale.

Appendix 32. Length (postorbital - hypural), sex and age of Nechako chinook spawners, September 1981.

| Date | Length (cm) | Sex | Age | Date | Length (cm) | Sex | Age |
|---|---|---|---|---|---|---|---|
| Sept. 22 | 81.5 | F | $5_2$ | Sept. 26 | 65.0 | M | $5_2$ |
| | 74.0 | F | $5_2$ | | 67.0 | M | $5_2$ |
| | 80.0 | M | $4_1$ | | 75.0 | M | $5_2$ |
| | 68.0 | F | $4_2$ | | 73.0 | F | $5_2$ |
| | 82.5 | M | $6_2$ | | 72.0 | M | R |
| | 82.5 | F | $5_2$ | | 61.0 | M | $4_2$ |
| Sept. 23 | 79.0 | M | $4_1$ | | 83.0 | M | $5_2$ |
| | 64.0 | F | $4_2$ | | 72.5 | F | $5_2$ |
| | 74.0 | M | $5_2$ | | 74.0 | F | $5_2$ |
| | 80.0 | M | $5_2$ | | 68.0 | F | $5_2$ |
| | 78.5 | F | $5_2$ | Sept. 27 | 61.0 | F | $5_2$ |
| | 70.0 | F | $5_2$ | | 75.0 | F | $5_2$ |
| Sept. 24 | 74.0 | F | $5_2$ | | 70.0 | M | $5_2$ |
| Sept. 25 | 75.0 | F | $5_2$ | | 77.0 | M | $5_2$ |
| | 84.0 | M | $5_2$ | | 78.0 | M | $5_2$ |
| | 70.0 | F | $5_2$ | | 73.0 | F | $5_2$ |
| | 68.0 | F | $4_2$ | | 67.0 | M | $6_2$ |
| | 82.0 | M | $5_2$ | | [illegible] | M | $5_2$ |
| | 80.0 | F | $5_2$ | | [illegible] | M | $5_2$ |
| | 76.0 | M | $5_2$ | | 72.0 | F | $5_2$ |
| | 78.0 | M | $5_2$ | | 65.0 | F | $4_2$ |
| | 82.0 | F | $4_1$ | | 71.0 | F | $5_2$ |
| | 76.0 | F | $5_2$ | | 79.0 | M | $5_2$ |
| | 75.0 | F | $5_2$ | | 69.0 | F | R |
| | 72.0 | F | $5_2$ | | 52.0 | F | $3_2$ |
| | 77.0 | F | $4_1$ | | 35.0 | M | $4_1$ |
| | 76.0 | F | $5_2$ | | 71.0 | M | $5_2$ |
| Sept. 26 | 65.0 | F | $4_2$ | | 69.0 | F | $5_2$ |
| | 66.5 | M | $4_2$ | | 76.0 | F | $5_2$ |
| | 62.0 | M | $4_2$ | | 72.0 | F | R |
| | 60.5 | F | $3_1$ | | 64.0 | F | $6_2$ |
| | 75.5 | F | $5_2$ | | 77.0 | M | $5_2$ |
| | 58.0 | M | $4_2$ | | 70.0 | F | $5_2$ |
| | 69.0 | F | $5_2$ | | 80.0 | M | $5_2$ |
| | 75.0 | M | $5_2$ | | 71.0 | F | $5_1$ |
| | 76.5 | M | $5_2$ | | 82.0 | M | R |
| | 80.0 | M | R[a] | | 48.0 | F | $4_2$ |
| | 73.0 | F | $5_2$ | | 52.0 | F | $4_2$ |
| | 69.5 | M | $5_2$ | | 62.0 | M | R |
| | 69.5 | F | $5_2$ | | 64.0 | M | R |
| | 61.5 | M | $4_2$ | | 72.0 | M | $5_2$ |
| | 72.0 | F | $5_2$ | | 76.0 | M | $5_2$ |
| | 58.0 | M | $4_2$ | | 69.0 | M | $5_2$ |
| | 54.0 | F | $4_2$ | | 68.0 | F | $5_2$ |
| | 69.5 | F | $5_2$ | | 74.0 | M | $5_2$ |
| | 55.0 | F | $4_2$ | | 63.0 | F | $4_2$ |

Appendix 32. (Cont'd.)

| Date | Length (cm) | Sex | Age | Date | Length (cm) | Sex | Age |
|---|---|---|---|---|---|---|---|
| Sept. 27 | 76.0 | M | $5_2$ | Sept. 28 | 78.0 | M | $5_2$ |
| | 57.0 | M | $4_2$ | | 45.0 | F | $4_2$ |
| | 77.0 | M | $5_2$ | | 45.0 | F | $4_2$ |
| | 67.0 | F | $4_2$ | | 78.5 | M | $5_2$ |
| | 55.0 | F | $4_2$ | | 65.0 | F | $5_2$ |
| | 62.0 | F | $4_2$ | | 57.0 | M | R |
| | 74.0 | F | $5_2$ | | 73.0 | F | $5_2$ |
| | 62.0 | F | $4_2$ | | 70.0 | F | $5_2$ |
| | 76.0 | F | $5_2$ | | 58.0 | F | $4_2$ |
| | 56.0 | M | $4_2$ | Sept. 29 | 71.0 | F | $5_2$ |
| | 51.0 | F | $4_2$ | | 74.5 | F | $5_2$ |
| | 71.0 | F | $5_2$ | | 57.0 | F | R |
| | 74.0 | F | $5_2$ | | 71.0 | M | $5_2$ |
| | 74.0 | F | $5_2$ | | 70.5 | F | $5_2$ |
| | 65.0 | F | $5_2$ | | 70.5 | F | R |
| | 76.0 | F | $5_2$ | | 71.5 | M | $5_2$ |
| | 62.0 | F | $4_2$ | | 61.0 | M | $4_2$ |
| | 74.0 | F | $5_2$ | | 69.0 | F | $4_2$ |
| | 78.0 | F | $4_1$ | | 64.0 | F | $4_2$ |
| Sept. 28 | 54.5 | F | R | | 67.0 | F | $4_2$ |
| | 63.0 | F | $4_2$ | | 63.5 | F | $4_2$ |
| | 74.0 | F | $5_2$ | | 71.0 | M | $5_2$ |
| | 80.5 | F | $5_2$ | | 80.0 | M | $5_2$ |
| | 73.5 | F | R | | 68.0 | F | $5_2$ |
| | 81.5 | M | R | | 69.0 | F | $5_2$ |
| | 76.0 | F | $5_2$ | | 68.0 | F | $5_2$ |
| | 76.0 | M | $5_2$ | Sept. 30 | 67.0 | F | $5_2$ |
| | 71.0 | F | $5_2$ | | 72.5 | F | $5_2$ |
| | 76.5 | M | $5_2$ | | 73.0 | M | $5_2$ |
| | 71.0 | M | $5_2$ | | 75.5 | F | $5_2$ |
| | 73.5 | F | $5_2$ | | 62.5 | F | $4_2$ |
| | 56.5 | F | $4_2$ | | 74.0 | M | $5_2$ |
| | 70.0 | M | R | | 70.5 | F | $5_2$ |
| | 74.0 | M | $5_2$ | | 80.0 | M | $5_2$ |
| | 83.0 | M | $5_2$ | | 72.5 | F | - |
| | 75.0 | M | $5_2$ | | 75.0 | M | $5_2$ |
| | 73.0 | F | $5_2$ | | 65.5 | M | $5_2$ |
| | 77.0 | M | $5_2$ | | 63.0 | F | $4_2$ |
| | 76.0 | F | $5_2$ | | 45.0 | F | R |
| | 65.0 | M | $4_2$ | | 84.5 | M | R |
| | 75.0 | F | $5_2$ | | | | |
| | 59.0 | F | $4_2$ | | | | |
| | 73.5 | F | $5_2$ | | | | |
| | 72.5 | F | $5_2$ | | | | |
| | 58.0 | M | R | | | | |
| | 69.0 | F | $5_2$ | | | | |
| | 81.0 | M | $5_2$ | | | | |

[a] R indicates resorbed scale.

Appendix 33. Length (postorbital - hypural), sex and age of Nechako chinook spawners, September 1982.

| Date | Length (cm) | Sex | Age | Date | Length (cm) | Sex | Age | Date | Length (cm) | Sex | Age |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sept. 11 | 71.0 | F | $5_2$ | Sept. 20 | 60.0 | F | R | Sept. 22 | 73.0 | M | $5_2$ |
| | 67.0 | M | $4_2$ | | 69.0 | M | $5_2$ | | 76.0 | F | $5_2$ |
| Sept. 12 | 74.5 | F | $5_2$ | | 71.5 | M | $5_2$ | | 73.5 | M | $5_2$ |
| Sept. 13 | 69.0 | F | $5_2$ | | 67.5 | M | $4_2$ | | 72.5 | M | $5_2$ |
| | 79.5 | M | $5_2$ | Sept. 21 | 75.5 | M | $5_2$ | | 71.0 | F | R |
| | 81.0 | M | $5_2$ | | 70.0 | F | $5_2$ | | 76.5 | M | $5_2$ |
| Sept. 14 | 82.5 | F | $5_2$ | | 71.5 | F | $5_2$ | | 80.5 | F | $5_2$ |
| | 69.0 | F | $5_2$ | | 77.5 | M | $5_2$ | | 76.5 | M | $5_2$ |
| | 79.0 | F | $5_2$ | | 76.5 | F | $5_2$ | | 66.5 | F | $5_2$ |
| Sept. 15 | 73.0 | F | $5_2$ | | 73.5 | M | $5_2$ | | 73.5 | F | $5_2$ |
| | 83.5 | M | $6_2$ | | 73.0 | F | R | | 83.0 | M | $5_2$ |
| | 69.0 | F | R[a] | | 78.5 | M | R | | 76.0 | F | $5_2$ |
| Sept. 16 | 77.0 | M | $5_2$ | | 73.5 | M | $5_2$ | Sept. 23 | 72.5 | M | $5_2$ |
| | 69.0 | F | $5_2$ | | 81.0 | M | $5_2$ | | 57.5 | F | $4_2$ |
| Sept. 17 | 66.0 | M | $5_2$ | Sept. 22 | 78.0 | M | $5_2$ | | 77.0 | F | $5_2$ |
| | 72.5 | F | $5_2$ | | 80.5 | M | $5_2$ | | 70.0 | M | $5_2$ |
| | 85.5 | M | $5_2$ | | 70.5 | F | $5_2$ | | 77.0 | M | $5_2$ |
| | 77.5 | M | $5_2$ | | 67.0 | F | $5_2$ | | 77.5 | M | $5_2$ |
| | 69.5 | F | $4_2$ | | 75.5 | F | $5_2$ | | 79.0 | M | $5_2$ |
| | 68.0 | F | R | | 74.0 | F | $5_2$ | | 72.5 | F | $5_2$ |
| | 75.0 | M | $5_2$ | | 71.5 | F | R | | 67.5 | M | $5_2$ |
| | 77.0 | M | R | | 77.5 | F | R | | 78.0 | M | R |
| | 69.0 | F | $5_2$ | | 73.0 | F | $5_2$ | | 63.0 | F | $4_2$ |
| Sept. 18 | 71.0 | F | $5_2$ | | 82.0 | M | $6_2$ | | 68.0 | M | $4_2$ |
| Sept. 19 | 75.0 | F | R | | 71.0 | F | $5_2$ | | 73.5 | F | $5_2$ |
| | 78.5 | F | $5_2$ | | 68.0 | F | $5_2$ | | 72.5 | M | $5_2$ |
| | 67.5 | F | $5_2$ | | 63.0 | F | $5_2$ | | 78.0 | M | $5_2$ |
| | 74.0 | M | $5_2$ | | 63.0 | F | R | | 73.5 | F | $5_2$ |
| | 69.0 | F | $5_2$ | | 74.5 | F | $5_2$ | | 59.5 | F | $4_2$ |
| | 75.0 | M | $5_2$ | | 77.0 | M | $5_2$ | | 72.5 | F | R |
| | 66.5 | F | $5_2$ | | 70.0 | F | $5_2$ | | 73.0 | F | $5_2$ |
| | 68.0 | F | $5_2$ | | 72.0 | M | $5_2$ | | 76.5 | F | $5_2$ |
| | 72.5 | M | $5_2$ | | 71.0 | M | R | | 77.0 | F | $5_2$ |
| | 72.0 | M | $5_2$ | | 76.0 | M | $5_2$ | | 72.5 | F | $5_2$ |
| | 75.0 | M | R | | 81.0 | M | $5_2$ | | 68.0 | M | $4_2$ |
| | 72.0 | M | $5_2$ | | 70.0 | F | R | | 74.5 | M | $5_2$ |
| | 70.5 | F | $5_2$ | | 62.0 | F | $4_2$ | | 60.5 | F | $4_2$ |
| | 76.0 | M | $5_2$ | | 75.0 | F | $5_2$ | | 71.5 | M | $5_2$ |
| Sept. 20 | 79.5 | M | R | | 68.0 | F | $5_2$ | | 72.5 | M | $5_2$ |
| | 77.0 | M | $5_2$ | | 67.0 | M | R | | 74.0 | F | $5_2$ |
| | 77.0 | M | $5_2$ | | 77.5 | M | $5_2$ | | 73.0 | M | $5_2$ |
| | 75.5 | F | $5_2$ | | 72.0 | M | $5_2$ | | 73.0 | M | $5_2$ |
| | 74.5 | F | $5_2$ | | 68.5 | F | $5_2$ | | 63.0 | F | $4_2$ |
| | 78.0 | M | $5_2$ | | 81.5 | M | $5_2$ | | 35.5 | F | $4_2$ |
| | 68.0 | F | $4_2$ | | 69.0 | M | $5_2$ | | 70.5 | F | $5_2$ |
| | 75.0 | M | $5_2$ | | 80.0 | M | $5_2$ | | 81.5 | M | $5_2$ |

Appendix 33. (Cont'd.)

| Date | Length (cm) | Sex | Age | Date | Length (cm) | Sex | Age |
|---|---|---|---|---|---|---|---|
| Sept. 23 | 62.0 | F | $4_2$ | Sept. 24 | 80.0 | M | $5_2$ |
| | 72.0 | F | R | | 73.0 | M | $5_2$ |
| | 70.5 | F | $5_2$ | | 72.5 | F | $5_2$ |
| | 78.5 | M | $5_2$ | | 72.0 | F | $5_2$ |
| | 82.0 | M | $5_2$ | | 74.5 | F | $5_2$ |
| | 77.0 | M | $5_2$ | | 72.0 | F | $5_2$ |
| | 72.0 | F | $5_2$ | | 65.5 | F | $5_2$ |
| | 71.5 | F | R | | 63.5 | F | $4_2$ |
| | 78.5 | M | $5_2$ | | 70.0 | F | $5_2$ |
| | 72.5 | M | $5_2$ | | 76.0 | M | $5_2$ |
| | 76.0 | M | $5_2$ | | 82.5 | M | R |
| | 75.5 | F | $5_2$ | | 75.0 | M | $5_2$ |
| | 65.0 | F | $4_2$ | | 71.0 | M | $5_2$ |
| | 61.0 | M | $4_2$ | | 72.0 | M | $5_2$ |
| | 69.5 | F | $5_2$ | | 73.0 | M | $5_2$ |
| | 70.5 | F | $5_2$ | | 70.0 | M | $4_2$ |
| | 74.5 | F | $5_2$ | | | | |
| | 69.0 | F | $5_2$ | | | | |
| | 83.0 | M | $5_2$ | | | | |
| | 73.0 | M | R | | | | |
| | 66.0 | F | $4_2$ | | | | |
| | 69.5 | F | $5_2$ | | | | |
| Sept. 24 | 66.0 | F | $4_2$ | | | | |
| | 71.5 | F | $5_2$ | | | | |
| | 76.5 | F | R | | | | |
| | 71.0 | F | $5_2$ | | | | |
| | 71.0 | F | $5_2$ | | | | |
| | 68.5 | M | $5_2$ | | | | |
| | 76.0 | M | R | | | | |
| | 77.0 | M | $5_2$ | | | | |
| | 71.0 | M | $5_2$ | | | | |
| | 84.0 | M | $5_2$ | | | | |
| | 81.0 | M | $5_2$ | | | | |
| | 68.0 | M | $5_2$ | | | | |
| | 58.5 | M | $4_2$ | | | | |
| | 69.5 | M | $5_2$ | | | | |
| | 67.0 | F | $5_2$ | | | | |
| | 74.0 | F | $5_2$ | | | | |
| | 73.0 | F | $5_2$ | | | | |
| | 67.0 | F | $5_2$ | | | | |
| | 73.0 | F | $5_2$ | | | | |
| | 81.0 | M | $5_2$ | | | | |
| | 78.0 | M | $5_2$ | | | | |
| | 74.5 | M | $5_2$ | | | | |
| | 74.0 | M | $5_2$ | | | | |
| | 83.5 | M | $5_2$ | | | | |

[a] R indicates resorbed scale.

✓ corrected against original

Appendix 34. Mean daily water temperatures (°C), temperature ranges and accumulated heat units (HU, °C - days ) in Nechako River at Irvine's Lodge, 1980/81.

| Date | Temperature | | | | Date | Temperature | | | | Date | Temperature | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | Max. | Min. | Total HU | | Mean | Max. | Min. | Total HU | | Mean | Max. | Min. | Total HU |
| 1980 | | | | | | | | | | | | | | |
| Sept. 1 | 14.7 | 15.0 | 14.3 | | Oct. 1 | 11.7 | 12.2 | 11.1 | 176 | Nov. 1 | 7.9 | 8.2 | 7.6 | 481 |
| 2 | 14.6 | 15.6 | 13.6 | | 2 | 11.9 | 12.7 | 11.0 | 188 | 2 | 7.5 | 7.8 | 7.2 | 489 |
| 3 | 13.9 | 14.4 | 13.4 | | 3 | 11.9 | 12.7 | 11.0 | 200 | 3 | 7.3 | 7.5 | 7.1 | 496 |
| 4 | 13.6 | 13.9 | 13.3 | | 4 | 12.1 | 12.6 | 11.6 | 217 | 4 | 7.3 | 7.4 | 7.2 | 504 |
| 5 | 13.9 | 14.6 | 13.2 | | 5 | 11.9 | 12.2 | 11.7 | 224 | 5 | 7.6 | 7.7 | 7.4 | 511 |
| 6 | 13.9 | 14.4 | 13.4 | | 6 | 11.7 | 12.3 | 11.0 | 235 | 6 | 7.6 | 7.8 | 7.4 | 519 |
| 7 | 13.8 | 15.3 | 12.3 | | 7 | 11.7 | 12.2 | 11.1 | 247 | 7 | 7.3 | 7.3 | 7.2 | 526 |
| 8 | 14.1 | 15.6 | 12.7 | | 8 | 11.3 | 11.7 | 11.0 | 258 | 8 | 7.1 | 7.2 | 6.9 | 533 |
| 9 | 14.4 | 15.6 | 13.3 | | 9 | 10.8 | 11.4 | 10.1 | 296 | 9 | 6.6 | 6.9 | 6.2 | 540 |
| 10 | 14.6 | 15.6 | 13.6 | | 10 | 10.6 | 11.1 | 10.0 | 280 | 10 | 6.3 | 6.6 | 6.1 | 546 |
| 11 | 14.4 | 15.4 | 13.4 | | 11 | 10.5 | 11.1 | 9.9 | 290 | 11 | 6.2 | 6.3 | 6.0 | 552 |
| 12 | 13.9 | 14.6 | 13.1 | | 12 | 10.7 | 11.1 | 10.3 | 301 | 12 | 6.2 | 6.3 | 6.0 | 558 |
| 13 | 13.6 | 14.3 | 12.8 | | 13 | 10.8 | 11.1 | 10.6 | 312 | 13 | 6.3 | 6.4 | 6.1 | 565 |
| 14 | 13.6 | 14.9 | 12.2 | | 14 | 10.4 | 10.7 | 10.1 | 322 | 14 | 6.4 | 6.6 | 6.2 | 571 |
| 15 | 14.1 | 15.1 | 13.1 | | 15 | 10.2 | 10.4 | 9.9 | 332 | 15 | 5.8 | 6.0 | 5.6 | 577 |
| 16 | 14.2 | 15.0 | 13.3 | | 16 | 10.2 | 10.6 | 9.9 | 342 | 16 | 5.9 | 6.1 | 5.7 | 583 |
| 17 | 14.1 | 14.8 | 13.3 | | 17 | 10.2 | 10.6 | 9.9 | 353 | 17 | 5.7 | 5.8 | 5.4 | 589 |
| 18 | 13.4 | 13.9 | 13.0 | 13 | 18 | 10.2 | 10.6 | 9.9 | 363 | 18 | 5.4 | 5.6 | 5.2 | 594 |
| 19 | 13.6 | 13.9 | 13.2 | 27 | 19 | 10.2 | 10.6 | 9.9 | 373 | 19 | 5.2 | 5.4 | 5.0 | |
| 20 | 12.9 | 13.4 | 12.3 | 40 | 20 | 9.8 | 9.9 | 9.6 | 383 | 20 | 5.4 | 5.6 | 5.2 | |
| 21 | 12.6 | 13.0 | 12.2 | 53 | 21 | 9.1 | 9.3 | 8.8 | 392 | 21 | 4.9 | 5.3 | 4.4 | |
| 22 | 12.8 | 13.2 | 12.2 | 65 | 22 | 8.7 | 9.0 | 8.3 | 401 | 22 | 4.1 | 4.4 | 3.8 | |
| 23 | 12.3 | 12.8 | 11.8 | 78 | 23 | 8.3 | 8.7 | 8.0 | 409 | 23 | - | - | - | |
| 24 | 12.7 | 13.2 | 12.0 | 90 | 24 | 8.4 | 8.8 | 8.1 | 417 | 24 | 4.0 | 4.4 | 3.6 | |
| 25 | 12.7 | 13.6 | 11.7 | 103 | 25 | 8.5 | 8.8 | 8.2 | 426 | 25 | 4.2 | 4.4 | 4.0 | |
| 26 | 12.7 | 13.2 | 12.0 | 116 | 26 | 8.0 | 8.2 | 7.8 | 434 | 26 | 4.2 | 4.4 | 3.9 | |
| 27 | 12.3 | 12.8 | 11.9 | 128 | 27 | 7.6 | 7.9 | 7.2 | 441 | 27 | 4.0 | 4.2 | 3.8 | |
| 28 | 12.0 | 12.2 | 11.8 | 140 | 28 | 8.1 | 8.4 | 7.7 | 450 | 28 | 3.6 | 3.6 | 3.6 | |
| 29 | 12.3 | 12.8 | 11.8 | 152 | 29 | 8.1 | 8.3 | 7.7 | 458 | 29 | 2.9 | 3.3 | 2.4 | |
| 30 | 11.8 | 12.2 | 11.4 | 164 | 30 | 7.8 | 7.9 | 7.6 | 465 | 30 | 2.0 | 2.2 | 1.8 | |
| | | | | | 31 | 8.1 | 8.3 | 7.8 | 474 | | | | | |

Appendix 34. (Cont'd.)

| Date | Temperature | | | Date | Temperature | | | Date | Temperature | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | Max. | Min. | | Mean | Max. | Min. | | Mean | Max. | Min. |
| 1980 | | | | 1981 | | | | | | | |
| Dec. 1 | 1.6 | 1.7 | 1.6 | Jan. 1 | –[a] | | | Feb. 1 | 1.3 | 1.6 | 1.1 |
| 2 | 1.3 | 1.6 | 1.1 | 2 | –[a] | | | 2 | 1.4 | 1.6 | 1.2 |
| 3 | 1.3 | 1.6 | 1.1 | 3 | –[a] | | | 3 | 1.5 | 1.6 | 1.4 |
| 4 | 1.7 | 1.7 | 1.6 | 4 | –[a] | | | 4 | 1.3 | 1.4 | 1.2 |
| 5 | 1.5 | 1.7 | 1.3 | 5 | –[a] | | | 5 | 1.3 | 1.6 | 1.1 |
| 6 | 1.3 | 1.3 | 1.3 | 6 | –[a] | | | 6 | 1.6 | 1.7 | 1.4 |
| 7 | 1.4 | 1.6 | 1.3 | 7 | –[a] | | | 7 | 1.4 | 1.7 | 1.1 |
| 8 | 1.8 | 2.0 | 1.7 | 8 | –[a] | | | 8 | 1.6 | 1.7 | 1.3 |
| 9 | 2.3 | 2.4 | 2.1 | 9 | –[a] | | | 9 | –[b] | | |
| 10 | 2.4 | 2.6 | 2.2 | 10 | –[a] | | | 10 | –[b] | | |
| 11 | 2.4 | 2.5 | 2.2 | 11 | –[a] | | | 11 | –[b] | | |
| 12 | 2.3 | 2.3 | 2.2 | 12 | 1.6 | 1.7 | 1.6 | 12 | –[b] | | |
| 13 | 2.4 | 2.6 | 2.2 | 13 | 1.5 | 1.7 | 1.4 | 13 | –[b] | | |
| 14 | 2.7 | 2.7 | 2.7 | 14 | 1.6 | 1.6 | 1.5 | 14 | –[b] | | |
| 15 | 2.6 | 2.7 | 2.5 | 15 | 1.4 | 1.6 | 1.2 | 15 | –[b] | | |
| 16 | 2.3 | 2.7 | 1.9 | 16 | 1.5 | 1.6 | 1.4 | 16 | –[b] | | |
| 17 | 1.6 | 1.8 | 1.4 | 17 | 1.0 | 1.1 | 0.8 | 17 | –[b] | | |
| 18 | 1.1 | 1.2 | 0.8 | 18 | 1.3 | 1.6 | 1.1 | 18 | –[b] | | |
| 19 | 1.0 | 1.1 | 0.8 | 19 | 1.6 | 1.8 | 1.4 | 19 | –[b] | | |
| 20 | 1.1 | 1.1 | 1.0 | 20 | 1.7 | 1.8 | 1.6 | 20 | –[b] | | |
| 21 | 1.1 | 1.1 | 1.0 | 21 | 1.6 | 1.7 | 1.5 | 21 | –[b] | | |
| 22 | 1.3 | 1.4 | 1.1 | 22 | 1.6 | 1.7 | 1.5 | 22 | –[b] | | |
| 23 | 1.4 | 1.6 | 1.3 | 23 | 1.3 | 1.6 | 1.2 | 23 | –[b] | | |
| 24 | 1.3 | 1.6 | 1.1 | 24 | 1.3 | 1.6 | 1.1 | 24 | 1.4 | 1.8 | 1.1 |
| 25 | 1.4 | 1.7 | 1.1 | 25 | 1.2 | 1.4 | 1.1 | 25 | 2.1 | 2.4 | 1.7 |
| 26 | 1.8 | 1.9 | 1.6 | 26 | 1.4 | 1.7 | 1.1 | 26 | 2.1 | 2.4 | 1.7 |
| 27 | 2.0 | 2.1 | 1.9 | 27 | 1.8 | 1.9 | 1.6 | 27 | 1.7 | 2.2 | 1.1 |
| 28 | 1.7 | 1.8 | 1.6 | 28 | 1.9 | 2.1 | 1.7 | 28 | 1.9 | 2.4 | 1.5 |
| 29 | 1.6 | 1.7 | 1.4 | 29 | 2.0 | 2.2 | 1.8 | | | | |
| 30 | 1.6 | 1.7 | 1.4 | 30 | 1.7 | 1.8 | 1.7 | | | | |
| 31 | –[a] | – | –[a] | 31 | 1.2 | 1.2 | 1.1 | | | | |

[a] Instrument malfunctioned.

[b] Minimum and maximum temperatures during this period were 1.1°C and 2.7 °C respectively; therefore mean temperature was 1.9 °C.

Appendix 35. Mean daily water temperatures (°C), temperature ranges and accumulated heat units (HU, °C - days ) in two artificial redds, and ambient air temperatures, Nechako River, 1982/83 (depth of probe in gravel is given in parenthesis).

| Date | | Artificial redd | | | | | | | | | | | | Artificial exposed redd | | | | Air temperature | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Temperature (10 cm) | | | | Temperature (30 cm) | | | | Temperature (40 cm) | | | | Temperature (10 cm) | | | | | | |
| | | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. |
| 1982 | | | | | | | | | | | | | | | | | | | | |
| Sept. | 16 | 14.6 | 15.2 | 14.1 | 14.6 | 14.6 | 15.3 | 13.9 | 14.6 | 14.6 | 15.2 | 14.1 | 14.6 | 14.9 | 16.3 | 13.6 | 14.9 | Not available | | |
| | 17 | 14.7 | 15.6 | 13.9 | 29 | 14.9 | 15.9 | 14.0 | 30 | 14.8 | 15.7 | 14.0 | 29 | 15.5 | 18.0 | 13.1 | 30 | until | | |
| | 18 | 14.9 | 15.7 | 14.2 | 44 | 15.0 | 15.9 | 14.1 | 45 | 14.9 | 15.7 | 14.2 | 44 | 15.8 | 18.3 | 13.3 | 46 | Nov. 9 | | |
| | 19 | 15.0 | 15.7 | 14.3 | 59 | 15.0 | 15.9 | 14.1 | 60 | 15.0 | 15.7 | 14.3 | 59 | 15.6 | 18.0 | 13.3 | 62 | | | |
| | 20 | 14.9 | 15.6 | 14.2 | 74 | 14.9 | 15.8 | 14.1 | 74 | 14.9 | 15.6 | 14.2 | 74 | 15.7 | 18.1 | 13.4 | 76 | | | |
| | 21 | 15.1 | 15.8 | 14.4 | 89 | 15.1 | 16.0 | 14.3 | 90 | 15.1 | 15.8 | 14.4 | 89 | 15.8 | 18.4 | 13.3 | 93 | | | |
| | 22 | 15.1 | 15.8 | 14.5 | 104 | 15.2 | 16.1 | 14.3 | 105 | 15.1 | 15.8 | 14.5 | 104 | 15.5 | 18.3 | 12.8 | 109 | | | |
| | 23 | 15.0 | 15.6 | 14.4 | 119 | 15.0 | 15.8 | 14.2 | 120 | 15.0 | 15.7 | 14.4 | 119 | 15.3 | 18.0 | 12.6 | 124 | | | |
| | 24 | 14.9 | 15.5 | 14.3 | 134 | 14.7 | 15.7 | 13.8 | 134 | 14.8 | 15.5 | 14.1 | 134 | 15.2 | 18.0 | 12.4 | 139 | | | |
| | 25 | 14.5 | 15.1 | 13.9 | 149 | 14.5 | 15.3 | 13.8 | 149 | 14.5 | 15.1 | 14.0 | 149 | 15.0 | 17.3 | 12.7 | 154 | | | |
| | 26 | 14.3 | 14.5 | 14.1 | 163 | 14.3 | 14.6 | 14.1 | 163 | 14.3 | 14.5 | 14.2 | 163 | 14.2 | 15.2 | 13.3 | 169 | | | |
| | 27 | 14.4 | 14.8 | 14.0 | 177 | 14.4 | 15.0 | 13.9 | 178 | 14.4 | 14.9 | 14.0 | 177 | 14.9 | 16.8 | 13.0 | 183 | | | |
| | 28 | 13.9 | 14.3 | 13.6 | 191 | 13.8 | 14.4 | 13.3 | 191 | 13.9 | 14.3 | 13.5 | 191 | 13.3 | 14.6 | 12.1 | 197 | | | |
| | 29 | 13.4 | 13.7 | 13.1 | 205 | 13.3 | 13.8 | 12.8 | 205 | 13.4 | 13.8 | 13.0 | 205 | 13.0 | 14.6 | 11.5 | 210 | | | |
| | 30 | 13.3 | 13.9 | 12.8 | 218 | 13.3 | 14.1 | 12.5 | 218 | 13.4 | 14.0 | 12.8 | 218 | 13.4 | 16.0 | 10.8 | 223 | | | |
| Oct. | 1 | 13.2 | 13.8 | 12.6 | 231 | 13.2 | 13.9 | 12.5 | 231 | 13.2 | 13.8 | 12.6 | 231 | 13.6 | 16.1 | 11.1 | 237 | | | |
| | 2 | 13.1 | 13.5 | 12.7 | 244 | 13.0 | 13.7 | 12.4 | 244 | 13.1 | 13.6 | 12.6 | 244 | 12.6 | 14.4 | 10.8 | 249 | | | |
| | 3 | 12.7 | 13.1 | 12.4 | 257 | 12.6 | 13.2 | 12.0 | 257 | 12.6 | 13.1 | 12.2 | 257 | 12.3 | 14.5 | 10.2 | 262 | | | |
| | 4 | 12.4 | 12.8 | 12.0 | 269 | 12.3 | 13.0 | 11.7 | 269 | 12.4 | 12.9 | 11.9 | 269 | 11.8 | 13.8 | 9.9 | 273 | | | |
| | 5 | 12.1 | 12.6 | 11.7 | 282 | 12.2 | 12.8 | 11.7 | 281 | 12.2 | 12.7 | 11.8 | 282 | 11.8 | 13.7 | 9.9 | 285 | | | |
| | 6 | 11.8 | 12.0 | 11.7 | 293 | 11.9 | 12.1 | 11.7 | 293 | 11.8 | 12.0 | 11.7 | 293 | 10.9 | 11.7 | 10.1 | 296 | | | |
| | 7 | 11.7 | 11.9 | 11.6 | 305 | 11.6 | 12.0 | 11.2 | 305 | 11.7 | 12.0 | 11.5 | 305 | 10.6 | 11.7 | 9.5 | 307 | | | |
| | 8 | 11.2 | 11.6 | 10.9 | 316 | 11.1 | 11.7 | 10.6 | 316 | 11.2 | 11.7 | 10.8 | 316 | 10.4 | 12.3 | 8.5 | 317 | | | |
| | 9 | 10.9 | 11.2 | 10.6 | 327 | 10.9 | 11.3 | 10.6 | 327 | 10.9 | 11.2 | 10.7 | 327 | 10.1 | 11.3 | 8.9 | 327 | | | |
| | 10 | 11.4 | 11.8 | 11.1 | 339 | 11.5 | 11.9 | 11.1 | 338 | 11.4 | 11.8 | 11.1 | 339 | 11.6 | 13.0 | 10.2 | 339 | | | |
| | 11 | 11.5 | 11.7 | 11.3 | 350 | 11.3 | 11.8 | 10.8 | 350 | 11.4 | 11.7 | 11.1 | 350 | 10.8 | 12.4 | 9.2 | 350 | | | |
| | 12 | 11.2 | 11.6 | 10.8 | 361 | 11.1 | 11.7 | 10.5 | 361 | 11.2 | 11.6 | 10.8 | 361 | 11.1 | 13.6 | 8.7 | 361 | | | |
| | 13 | 11.0 | 11.5 | 10.5 | 372 | 11.0 | 11.6 | 10.5 | 372 | 11.1 | 11.6 | 10.6 | 372 | 11.1 | 13.5 | 8.8 | 372 | | | |
| | 14 | 11.3 | 11.9 | 10.8 | 384 | 11.3 | 12.0 | 10.7 | 383 | 11.3 | 11.9 | 10.8 | 384 | 12.0 | 14.6 | 9.5 | 384 | | | |
| | 15 | 11.5 | 11.8 | 11.2 | 395 | 11.4 | 11.9 | 11.0 | 394 | 11.5 | 11.9 | 11.2 | 395 | 11.6 | 13.2 | 10.0 | 395 | | | |
| | 16 | 11.2 | 11.4 | 11.1 | 406 | 11.1 | 11.4 | 10.8 | 406 | 11.2 | 11.4 | 11.1 | 406 | 10.8 | 12.0 | 9.7 | 406 | | | |
| | 17 | 10.6 | 11.2 | 10.0 | 417 | 10.2 | 11.0 | 9.5 | 416 | 10.4 | 11.1 | 9.8 | 417 | 9.2 | 11.2 | 1.2 | 415 | | | |

Appendix 35. (Cont'd.)

| Date | | Artificial redd | | | | | | | | | | | | Artificial exposed redd | | | | Air temperature | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Temperature (10 cm) | | | | Temperature (30 cm) | | | | Temperature (40 cm) | | | | Temperature (10 cm) | | | | | | |
| | | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. |
| Oct. | 18 | 9.7 | 10.0 | 9.4 | 427 | 9.6 | 10.2 | 9.0 | 425 | 9.7 | 10.1 | 9.3 | 426 | 8.1 | 10.1 | 6.1 | 424 | | | |
| | 19 | 9.4 | 9.8 | 9.0 | 436 | 9.4 | 9.9 | 9.0 | 435 | 9.4 | 9.8 | 9.1 | 436 | 8.4 | 10.6 | 6.2 | 432 | | | |
| | 20 | 9.0 | 9.3 | 8.8 | 445 | 9.0 | 9.5 | 8.6 | 444 | 9.0 | 9.3 | 8.7 | 445 | 8.1 | 9.7 | 6.5 | 440 | | | |
| | 21 | 8.9 | 9.2 | 8.7 | 454 | 8.9 | 9.3 | 8.6 | 453 | 8.9 | 9.2 | 8.6 | 454 | 8.1 | 9.7 | 6.6 | 448 | | | |
| | 22 | 8.8 | 8.9 | 8.7 | 463 | 8.8 | 9.0 | 8.7 | 462 | 8.8 | 8.9 | 8.7 | 463 | 7.7 | 8.5 | 7.0 | 456 | | | |
| | 23 | 8.9 | 9.2 | 8.6 | 472 | 8.7 | 9.3 | 8.2 | 470 | 8.8 | 9.2 | 8.4 | 472 | 7.8 | 9.5 | 6.1 | 464 | | | |
| | 24 | 8.5 | 8.8 | 8.3 | 480 | 8.5 | 8.9 | 8.2 | 497 | 8.5 | 8.7 | 8.3 | 480 | 7.6 | 9.1 | 6.2 | 471 | | | |
| | 25 | 8.7 | 9.0 | 8.4 | 489 | 8.6 | 9.0 | 8.3 | 488 | 8.6 | 8.9 | 8.3 | 489 | 8.3 | 10.0 | 6.6 | 480 | | | |
| | 26 | 8.9 | 9.0 | 8.8 | 498 | 8.9 | 9.1 | 8.7 | 496 | 8.8 | 9.0 | 8.7 | 497 | 8.9 | 9.7 | 8.1 | 489 | | | |
| | 27 | 8.7 | 9.0 | 8.5 | 506 | 8.6 | 9.1 | 8.1 | 505 | 8.6 | 8.9 | 8.3 | 506 | 8.3 | 9.8 | 6.9 | 497 | | | |
| | 28 | 8.3 | 8.5 | 8.2 | 515 | 8.2 | 8.5 | 7.9 | 513 | 8.2 | 8.4 | 8.1 | 514 | 7.4 | 8.4 | 6.4 | 504 | | | |
| | 29 | 7.7 | 8.2 | 7.2 | 522 | 7.4 | 7.9 | 6.9 | 521 | 7.5 | 8.1 | 7.0 | 522 | 6.0 | 7.0 | 5.0 | 510 | | | |
| | 30 | 7.2 | 7.5 | 7.0 | 530 | 7.2 | 7.5 | 6.9 | 528 | 7.2 | 7.4 | 7.0 | 529 | 6.2 | 7.5 | 5.0 | 516 | | | |
| | 31 | 7.5 | 7.7 | 7.3 | 537 | 7.5 | 7.8 | 7.3 | 535 | 7.5 | 7.7 | 7.3 | 536 | 7.3 | 8.3 | 6.3 | 524 | | | |
| Nov. | 1 | 7.3 | 7.6 | 7.1 | 544 | 7.1 | 7.7 | 6.6 | 542 | 7.2 | 7.6 | 6.8 | 544 | 6.1 | 7.6 | 4.7 | 530 | | | |
| | 2 | 6.8 | 7.1 | 6.6 | 551 | 6.6 | 7.0 | 6.2 | 549 | 6.6 | 6.9 | 6.4 | 550 | 5.6 | 7.0 | 4.2 | 535 | | | |
| | 3 | 6.4 | 6.6 | 6.3 | 558 | 6.4 | 6.6 | 6.2 | 555 | 6.4 | 6.6 | 6.3 | 557 | 5.1 | 6.0 | 4.3 | 541 | | | |
| | 4 | 6.6 | 6.7 | 6.5 | 564 | 6.6 | 6.8 | 6.5 | 562 | 6.6 | 6.7 | 6.5 | 563 | 5.8 | 6.3 | 5.4 | 546 | | | |
| | 5 | 6.6 | 6.8 | 6.4 | 571 | 6.5 | 6.9 | 6.2 | 569 | 6.5 | 6.8 | 6.3 | 570 | 6.1 | 7.3 | 5.0 | 552 | | | |
| | 6 | 6.2 | 6.5 | 6.0 | 577 | 6.0 | 6.4 | 5.7 | 575 | 6.0 | 6.3 | 5.8 | 576 | 4.8 | 5.7 | 3.9 | 557 | | | |
| | 7 | 5.9 | 6.1 | 5.7 | 583 | 5.7 | 6.1 | 5.4 | 580 | 5.7 | 6.0 | 5.5 | 581 | 4.8 | 6.0 | 3.6 | 562 | | | |
| | 8 | 5.5 | 5.7 | 5.4 | 588 | 5.6 | 5.8 | 5.4 | 586 | 5.5 | 5.7 | 5.4 | 587 | 4.4 | 5.1 | 3.7 | 566 | | | |
| | 9 | 5.8 | 5.9 | 5.7 | 594 | 5.7 | 6.0 | 5.4 | 592 | 5.8 | 5.9 | 5.7 | 593 | 4.6 | 5.5 | 3.8 | 571 | - 3.6 | 2.0 | - 9.2 |
| | 10 | 5.7 | 5.9 | 5.5 | 600 | 5.5 | 5.8 | 5.3 | 597 | 5.6 | 5.8 | 6.4 | 599 | 4.6 | 5.6 | 3.7 | 576 | - 1.7 | 3.3 | - 6.7 |
| | 11 | 5.4 | 5.6 | 5.3 | 605 | 5.3 | 5.7 | 4.9 | 603 | 5.4 | 5.6 | 5.2 | 604 | 4.4 | 5.6 | 3.3 | 580 | - 3.9 | 4.3 | -12.1 |
| | 12 | 5.2 | 5.4 | 5.0 | 610 | 5.0 | 5.2 | 4.8 | 608 | 5.0 | 5.2 | 4.9 | 609 | 5.1 | 5.0 | 3.3 | 584 | - 4.4 | - 0.2 | - 8.6 |
| | 13 | 4.8 | 5.0 | 4.6 | 615 | 4.7 | 5.1 | 4.3 | 613 | 4.7 | 5.0 | 4.4 | 614 | 3.9 | 5.1 | 2.8 | 588 | - 6.1 | 1.5 | -13.7 |
| | 14 | 4.4 | 4.6 | 4.3 | 620 | 4.3 | 4.6 | 4.1 | 617 | 4.4 | 4.5 | 4.3 | 618 | 3.5 | 4.4 | 2.7 | 592 | - 5.4 | - 0.1 | -10.7 |
| | 15 | 4.3 | 4.4 | 4.2 | 624 | 4.3 | 4.5 | 4.1 | 621 | 4.2 | 4.4 | 4.1 | 622 | 3.5 | 4.3 | 2.7 | 595 | - 1.3 | 5.8 | - 8.3 |
| | 16 | 4.6 | 4.8 | 4.4 | 628 | 4.6 | 4.9 | 4.4 | 626 | 4.6 | 4.8 | 4.4 | 627 | 4.1 | 4.7 | 3.5 | 599 | 0.8 | 5.2 | - 3.7 |
| | 17 | 4.6 | 4.8 | 4.4 | 633 | 4.4 | 4.6 | 4.2 | 630 | 4.5 | 4.7 | 4.4 | 631 | 3.7 | 4.1 | 3.3 | 603 | - 3.6 | 1.1 | - 8.3 |
| | 18 | 4.4 | 4.5 | 4.3 | 637 | 4.2 | 4.5 | 4.0 | 634 | 4.3 | 4.4 | 4.2 | 636 | 3.7 | 4.4 | 3.0 | 607 | - 3.6 | 1.3 | - 8.6 |
| | 19 | 3.7 | 4.4 | 3.1 | 641 | 3.3 | 4.0 | 2.7 | 638 | 3.6 | 4.2 | 3.0 | 639 | 2.0 | 3.0 | 1.0 | 609 | -14.1 | - 8.5 | -19.7 |
| | 20 | 2.9 | 3.2 | 2.7 | 644 | 2.7 | 3.0 | 2.5 | 640 | 2.8 | 3.0 | 2.6 | 642 | 1.3 | 1.8 | 0.9 | 610 | -16.1 | -13.2 | -19.0 |

Appendix 35. (Cont'd.)

| Date | Artificial redd | | | | | | | | | | | | Artificial exposed redd | | | | Air temperature | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature (10 cm) | | | | Temperature (30 cm) | | | | Temperature (40 cm) | | | | Temperature (10 cm) | | | | | | |
| | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. |
| Nov. 21 | 2.5 | 2.8 | 2.2 | 647 | 2.1 | 2.6 | 1.6 | 642 | 2.3 | 2.7 | 2.0 | 644 | 0.8 | 1.4 | 0.3 | 611 | -20.3 | -13.7 | -26.9 |
| 22 | 1.9 | 2.2 | 1.6 | 648 | 1.5 | 1.9 | 1.2 | 644 | 1.7 | 2.0 | 1.5 | 646 | 0.5 | 0.7 | 0.3 | 611 | -19.5 | -12.2 | -26.7 |
| 23 | 1.5 | 1.7 | 1.3 | 650 | 1.3 | 1.5 | 1.1 | 645 | 1.4 | 1.5 | 1.3 | 648 | 0.3 | 0.4 | 0.2 | 611 | -20.7 | -14.5 | -26.9 |
| 24 | 1.4 | 1.6 | 1.2 | 651 | 1.4 | 1.7 | 1.1 | 647 | 1.4 | 1.7 | 1.2 | 649 | 0.2 | 0.3 | 0.2 | 612 | -19.5 | -14.0 | -24.9 |
| 25 | 1.7 | 1.9 | 1.6 | 653 | 1.7 | 2.0 | 1.5 | 648 | 1.7 | 1.9 | 1.6 | 651 | - 0.2 | 0.2 | - 0.6 | 612 | -15.8 | 10.0 | -21.5 |
| 26 | 1.6 | 1.8 | 1.5 | 655 | 1.8 | 2.1 | 1.5 | 650 | 1.7 | 1.9 | 1.5 | 653 | - 0.8 | - 0.3 | - 1.2 | 612 | -13.0 | 8.3 | -17.7 |
| 27 | 2.0 | 2.3 | 1.8 | 657 | 2.2 | 2.4 | 2.1 | 652 | 2.1 | 2.3 | 1.9 | 655 | - 0.8 | - 0.2 | - 1.2 | 612 | - 5.5 | - 2.6 | - 8.3 |
| 28 | 2.4 | 2.7 | 2.2 | 659 | 2.5 | 2.7 | 2.3 | 655 | 2.4 | 2.7 | 2.2 | 657 | 0 | 0.1 | - 0.2 | 612 | - 1.6 | - 0.3 | - 2.9 |
| 29 | 2.7 | 2.8 | 2.6 | 662 | 2.7 | 2.9 | 2.5 | 657 | 2.6 | 2.7 | 2.5 | 660 | 0.1 | 0.2 | 0.1 | 612 | - 1.5 | 0.1 | - 3.1 |
| 30 | 2.5 | 2.6 | 2.5 | 664 | 2.5 | 2.7 | 2.3 | 660 | 2.5 | 2.6 | 2.4 | 662 | 0.1 | 0.2 | 0.1 | 612 | - 2.6 | 2.1 | - 7.2 |
| Dec. 1 | 2.4 | 2.5 | 2.3 | 667 | 2.3 | 2.4 | 2.3 | 662 | 2.3 | 2.4 | 2.3 | 665 | 0.6 | 1.1 | 0.1 | 613 | - 3.5 | - 2.2 | - 4.8 |
| 2 | 2.3 | 2.4 | 2.3 | 669 | 2.2 | 2.5 | 2.0 | 664 | 2.3 | 2.4 | 2.2 | 667 | 1.3 | 1.8 | 0.9 | 614 | - 3.1 | 0.3 | - 6.8 |
| 3 | 2.1 | 2.3 | 2.0 | 671 | 2.1 | 2.2 | 2.0 | 666 | 2.1 | 2.2 | 2.0 | 669 | 1.1 | 1.4 | 0.9 | 615 | - 4.4 | - 2.2 | - 6.5 |
| 4 | 2.2 | 2.3 | 2.1 | 673 | 2.0 | 2.4 | 1.7 | 668 | 2.1 | 2.3 | 1.9 | 671 | 1.3 | 2.4 | 0.3 | 617 | - 7.3 | 1.5 | -16.1 |
| 5 | 1.9 | 2.2 | 1.7 | 675 | 1.7 | 2.0 | 1.4 | 670 | 1.8 | 2.0 | 1.6 | 673 | 0.8 | 1.4 | 0.2 | 617 | -10.4 | - 1.8 | -19.0 |
| 6 | 1.6 | 1.7 | 1.5 | 677 | 1.5 | 1.7 | 1.4 | 672 | 1.5 | 1.6 | 1.4 | 674 | 0.5 | 0.9 | 0.2 | 618 | -14.4 | - 8.2 | -20.6 |
| 7 | 1.4 | 1.5 | 1.4 | 678 | 1.5 | 1.7 | 1.4 | 673 | 1.4 | 1.5 | 1.4 | 676 | 0.5 | 0.9 | 0.2 | 618 | -15.5 | -10.1 | -20.8 |
| 8 | 1.4 | 1.5 | 1.4 | 680 | 1.5 | 1.6 | 1.4 | 675 | 1.4 | 1.5 | 1.4 | 677 | 0.5 | 0.7 | 0.3 | 619 | -14.7 | -11.8 | -17.6 |
| 9 | 1.6 | 1.8 | 1.4 | 681 | 1.7 | 2.0 | 1.5 | 676 | 1.6 | 1.8 | 1.4 | 679 | 0.6 | 1.0 | 0.3 | 619 | -12.0 | - 6.6 | -17.4 |
| 10 | 1.7 | 1.9 | 1.6 | 683 | 1.7 | 2.0 | 1.5 | 678 | 1.7 | 1.9 | 1.6 | 681 | 0.8 | 1.2 | 0.4 | 620 | - 9.2 | - 6.1 | -12.2 |
| 11 | 1.8 | 1.9 | 1.7 | 685 | 1.7 | 1.8 | 1.6 | 680 | 1.7 | 1.8 | 1.6 | 682 | 0.9 | 1.1 | 0.7 | 621 | - 8.5 | - 7.5 | - 9.4 |
| 12 | 1.6 | 1.7 | 1.6 | 686 | 1.6 | 1.7 | 1.5 | 681 | 1.6 | 1.7 | 1.6 | 684 | 0.7 | 1.1 | 0.3 | 622 | -10.5 | - 7.5 | -13.5 |
| 13 | 1.6 | 1.7 | 1.5 | 688 | 1.5 | 1.7 | 1.3 | 683 | 1.5 | 1.6 | 1.4 | 685 | 0.7 | 1.1 | 0.3 | 623 | - 9.2 | - 4.0 | -14.3 |
| 14 | 1.4 | 1.5 | 1.3 | 689 | 1.3 | 1.6 | 1.1 | 684 | 1.4 | 1.5 | 1.2 | 687 | 0.7 | 1.1 | 0.3 | 623 | - 9.4 | - 5.2 | -13.6 |
| 15 | 1.4 | 1.6 | 1.2 | 691 | 1.4 | 1.8 | 1.1 | 685 | 1.4 | 1.6 | 1.2 | 688 | 0.8 | 1.8 | 0.8 | 624 | - 6.2 | - 1.0 | -11.3 |
| 16 | 1.4 | 1.6 | 1.3 | 692 | 1.3 | 1.5 | 1.2 | 687 | 1.4 | 1.6 | 1.3 | 689 | 0.6 | 1.0 | 0.3 | 624 | - 7.5 | - 3.5 | -11.4 |
| 17 | 1.7 | 1.7 | 1.3 | 694 | 1.6 | 1.8 | 1.5 | 688 | 1.5 | 1.7 | 1.3 | 691 | 1.1 | 1.5 | 0.7 | 626 | - 1.4 | 6.1 | - 8.9 |
| 18 | 1.6 | 1.9 | 1.6 | 695 | 1.7 | 2.0 | 1.4 | 690 | 1.7 | 1.9 | 1.6 | 693 | 1.0 | 1.8 | 0.3 | 627 | - 7.1 | - 0.5 | -13.6 |
| 19 | 1.5 | 1.9 | 1.4 | 697 | 1.5 | 1.7 | 1.3 | 692 | 1.6 | 1.8 | 1.4 | 694 | 0.6 | 1.0 | 0.3 | 627 | - 8.8 | - 4.9 | -12.6 |
| 20 | 1.2 | 1.7 | 1.4 | 698 | 1.4 | 1.8 | 1.0 | 693 | 1.4 | 1.7 | 1.2 | 696 | 0.8 | 1.5 | 0.1 | 628 | - 9.6 | - 2.2 | -16.9 |
| 21 | 1.3 | 1.4 | 1.1 | 700 | 1.2 | 1.4 | 1.0 | 694 | 1.2 | 1.3 | 1.1 | 697 | 0.4 | 0.6 | 0.2 | 629 | - 9.9 | - 6.6 | -13.2 |
| 22 | 1.4 | 1.4 | 1.3 | 701 | 1.4 | 1.5 | 1.3 | 696 | 1.3 | 1.4 | 1.1 | 698 | 0.7 | 0.9 | 0.5 | 629 | - 6.3 | - 5.8 | - 7.9 |
| 23 | 1.2 | 1.5 | 1.1 | 702 | 1.3 | 1.7 | 0.9 | 697 | 1.4 | 1.6 | 1.2 | 700 | 0.7 | 1.2 | 0.2 | 630 | -12.0 | - 5.1 | -18.9 |
| 24 | 1.2 | 1.3 | 1.1 | 703 | 1.0 | 1.2 | 0.9 | 698 | 1.1 | 1.2 | 1.0 | 701 | 0.4 | 0.5 | 0.2 | 630 | -12.6 | - 8.2 | -16.9 |

Appendix 5b. (cont'd.)

| Date | | Artificial redd | | | | | | | | | | | | Artificial exposed redd | | | | Air temperature | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Temperature (10 cm) | | | | Temperature (30 cm) | | | | Temperature (40 cm) | | | | Temperature (10 cm) | | | | | | |
| | | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. |
| Dec. | 25 | 1.2 | 1.4 | 1.0 | 705 | 1.3 | 1.6 | 1.0 | 699 | 1.2 | 1.5 | 1.0 | 702 | 0.3 | 0.4 | 0.2 | 631 | - 3.7 | 0.7 | - 8.1 |
| | 26 | 1.5 | 1.7 | 1.3 | 706 | 1.5 | 1.9 | 1.1 | 701 | 1.5 | 1.7 | 1.4 | 703 | 0.3 | 0.5 | 0.1 | 631 | - 5.2 | 3.1 | -13.4 |
| | 27 | 1.3 | 1.6 | 1.1 | 707 | 1.0 | 1.3 | 0.8 | 702 | 1.1 | 1.4 | 0.9 | 704 | 0.3 | 0.5 | 0.1 | 631 | -10.3 | - 0.8 | -19.8 |
| | 28 | 1.0 | 1.2 | 0.9 | 708 | 1.1 | 1.4 | 0.8 | 703 | 1.1 | 1.3 | 0.9 | 706 | 0.2 | 0.3 | 0.2 | 631 | -12.5 | - 7.1 | -17.9 |
| | 29 | 1.1 | 1.2 | 1.1 | 709 | 1.0 | 1.3 | 0.8 | 704 | 1.1 | 1.2 | 1.0 | 707 | 0.2 | 0.3 | 0.2 | 632 | -13.4 | - 6.8 | -20.0 |
| | 30 | 0.9 | 1.1 | 0.8 | 710 | 0.7 | 1.0 | 0.4 | 705 | 0.8 | 1.0 | 0.6 | 707 | 0.2 | 0.3 | 0.2 | 632 | -17.5 | -11.4 | -23.6 |
| | 31 | 0.6 | 0.8 | 0.5 | 611 | 0.6 | 0.8 | 0.4 | 705 | 0.6 | 0.7 | 0.5 | 708 | 0.2 | 0.2 | 0.2 | 632 | -17.5 | -13.9 | -21.0 |
| 1985 | | | | | | | | | | | | | | | | | | | | |
| Jan. | 1 | 0.8 | 1.1 | 0.6 | 712 | 1.0 | 1.3 | 0.8 | 708 | 0.9 | 1.1 | 0.7 | 709 | 0.1 | 0.2 | 0.1 | 632 | -12.7 | - 9.6 | -15.7 |
| | 2 | 1.2 | 1.4 | 1.1 | 713 | 1.4 | 1.6 | 1.2 | 708 | 1.3 | 1.5 | 1.1 | 710 | 0.1 | 0.2 | 0.1 | 632 | - 7.5 | - 5.3 | - 9.6 |
| | 3 | 1.5 | 1.7 | 1.4 | 714 | 1.5 | 1.8 | 1.2 | 709 | 1.5 | 1.7 | 1.4 | 712 | 0.1 | 0.1 | 0.1 | 632 | - 9.9 | - 3.3 | -16.5 |
| | 4 | 1.4 | 1.6 | 1.2 | 716 | 1.2 | 1.3 | 1.2 | 711 | 1.3 | 1.5 | 1.2 | 713 | 0.0 | 0.1 | 0.0 | 632 | - 9.8 | - 5.5 | -14.0 |
| | 5 | 1.3 | 1.5 | 1.2 | 717 | 1.2 | 1.6 | 0.9 | 712 | 1.3 | 1.5 | 1.2 | 714 | 0.0 | 0.0 | 0.0 | 632 | -10.1 | - 2.9 | -17.2 |
| | 6 | 1.2 | 1.4 | 1.0 | 718 | 1.0 | 1.2 | 0.9 | 713 | 1.1 | 1.3 | 1.0 | 715 | - 0.1 | 0.0 | - 0.1 | 632 | -10.4 | - 6.6 | -14.2 |
| | 7 | 1.2 | 1.4 | 1.1 | 720 | 1.3 | 1.4 | 1.2 | 714 | 1.2 | 1.4 | 1.1 | 717 | - 0.1 | 0.0 | - 0.1 | 632 | - 5.2 | - 1.8 | - 8.6 |
| | 8 | 1.3 | 1.5 | 1.2 | 721 | 1.4 | 1.6 | 1.2 | 715 | 1.3 | 1.5 | 1.2 | 718 | 0.0 | 0.1 | 0.0 | 632 | - 0.2 | 5.2 | - 5.5 |
| | 9 | 1.3 | 1.5 | 1.2 | 722 | 1.2 | 1.5 | 1.0 | 717 | 1.2 | 1.5 | 1.0 | 719 | 0.1 | 0.1 | 0.1 | 632 | - 4.9 | 0.9 | -10.6 |
| | 10 | 1.1 | 1.2 | 1.1 | 723 | 1.1 | 1.3 | 0.9 | 718 | 1.1 | 1.2 | 1.0 | 720 | 0.1 | 0.2 | 0.1 | 632 | - 6.9 | - 2.5 | -11.4 |
| | 11 | 1.0 | 1.2 | 0.8 | 724 | 0.9 | 1.1 | 0.7 | 719 | 0.9 | 1.1 | 0.8 | 721 | 0.1 | 0.2 | 0.1 | 633 | - 6.9 | - 2.8 | -11.0 |
| | 12 | 1.1 | 1.4 | 0.8 | 725 | 1.3 | 1.6 | 1.0 | 720 | 1.1 | 1.4 | 0.8 | 722 | 0.1 | 0.1 | 0.1 | 633 | - 0.4 | 6.0 | - 6.7 |
| | 13 | 1.3 | 1.4 | 1.3 | 727 | 1.1 | 1.5 | 0.7 | 721 | 1.2 | 1.4 | 1.1 | 723 | 0.1 | 0.2 | 0.1 | 633 | - 7.9 | - 0.3 | -15.4 |
| | 14 | 1.1 | 1.4 | 0.9 | 728 | 0.9 | 1.2 | 0.7 | 722 | 1.0 | 1.2 | 0.9 | 724 | 0.1 | 0.2 | 0.1 | 633 | - 8.3 | - 4.2 | -12.4 |
| | 15 | 1.1 | 1.2 | 1.0 | 729 | 1.0 | 1.2 | 0.7 | 723 | 1.0 | 1.2 | 0.9 | 725 | 0.1 | 0.2 | 0.1 | 633 | - 7.4 | - 0.2 | -14.6 |
| | 16 | 0.9 | 1.0 | 0.8 | 730 | 0.8 | 1.0 | 0.7 | 724 | 0.8 | 0.9 | 0.7 | 726 | 0.1 | 0.2 | 0.1 | 633 | - 8.9 | - 4.7 | -13.1 |
| | 17 | 0.9 | 1.0 | 0.8 | 731 | 0.9 | 1.1 | 0.8 | 725 | 0.9 | 1.0 | 0.8 | 727 | 0.2 | 0.3 | 0.2 | 633 | - 9.1 | - 4.3 | -13.9 |
| | 18 | 0.9 | 1.0 | 0.9 | 732 | 1.0 | 1.1 | 0.9 | 726 | 0.9 | 1.0 | 0.9 | 728 | 0.3 | 0.4 | 0.2 | 634 | - 7.6 | - 4.2 | -10.9 |
| | 19 | 1.1 | 1.3 | 1.0 | 733 | 1.2 | 1.5 | 1.0 | 727 | 1.2 | 1.4 | 1.0 | 729 | 0.5 | 0.9 | 0.2 | 634 | - 1.8 | 5.6 | - 9.1 |
| | 20 | 1.2 | 1.3 | 1.1 | 734 | 1.2 | 1.4 | 1.0 | 728 | 1.2 | 1.3 | 1.1 | 730 | 0.8 | 1.3 | 0.3 | 635 | - 3.8 | 0.4 | - 8.0 |
| | 21 | 1.1 | 1.2 | 1.0 | 735 | 0.9 | 1.4 | 0.4 | 729 | 1.0 | 1.3 | 0.7 | 731 | 0.7 | 1.4 | 0.1 | 636 | - 8.1 | 1.3 | -17.5 |
| | 22 | 0.8 | 1.0 | 0.6 | 736 | 0.6 | 0.9 | 0.4 | 730 | 0.7 | 0.8 | 0.6 | 732 | 0.3 | 0.5 | 0.2 | 636 | -11.2 | - 6.5 | -15.9 |
| | 23 | 0.6 | 0.8 | 0.5 | 736 | 0.4 | 0.6 | 0.3 | 730 | 0.6 | 0.7 | 0.5 | 733 | 0.3 | 0.4 | 0.2 | 636 | -14.4 | - 8.0 | -20.8 |
| | 24 | 0.6 | 0.7 | 0.6 | 646 | 0.3 | 0.4 | 0.3 | 730 | 0.5 | 0.6 | 0.5 | 733 | 0.2 | 0.3 | 0.2 | 636 | -18.9 | -16.7 | -21.0 |
| | 25 | 0.7 | 0.8 | 0.7 | 738 | 0.3 | 0.4 | 0.2 | 731 | 0.6 | 0.6 | 0.6 | 734 | 0.2 | 0.3 | 0.2 | 637 | -17.6 | -15.5 | -19.6 |
| | 26 | 0.6 | 0.8 | 0.5 | 739 | 0.3 | 0.4 | 0.2 | 731 | 0.5 | 0.6 | 0.4 | 734 | 0.2 | 0.3 | 0.2 | 637 | -12.2 | - 8.8 | -15.6 |

Appendix 35. (Cont'd.)

| Date | | Artificial redd | | | | | | | | | | | | Artificial exposed redd | | | | Air temperature | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Temperature (10 cm) | | | | Temperature (30 cm) | | | | Temperature (40 cm) | | | | Temperature (10 cm) | | | | | | |
| | | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. | Total HU | Mean | Max. | Min. |
| Dec. | 27 | 0.4 | 0.5 | 0.3 | 739 | 0.5 | 0.7 | 0.3 | 731 | 0.4 | 0.5 | 0.3 | 735 | 0.1 | 0.2 | 0.1 | 637 | - 6.8 | - 1.0 | -12.5 |
| | 28 | 0.6 | 0.8 | 0.4 | 739 | 0.6 | 1.0 | 0.3 | 732 | 0.7 | 0.9 | 0.5 | 735 | 0.1 | 0.2 | 0.1 | 637 | - 6.9 | 3.2 | -17.0 |
| | 29 | 0.6 | 0.8 | 0.4 | 740 | 0.4 | 0.6 | 0.3 | 732 | 0.5 | 0.6 | 0.4 | 736 | 0.1 | 0.2 | 0.1 | 637 | - 8.3 | - 4.3 | -12.2 |
| | 30 | 0.6 | 0.8 | 0.5 | 740 | 0.7 | 1.0 | 0.5 | 733 | 0.8 | 0.8 | 0.5 | 636 | 0.1 | 0.2 | 0.1 | 637 | - 4.6 | - 0.9 | - 8.2 |
| | 31 | 0.8 | 0.9 | 0.7 | 741 | 0.9 | 1.1 | 0.7 | 734 | 0.8 | 0.9 | 0.7 | 737 | 0.1 | 0.2 | 0.1 | 637 | - 4.1 | - 0.4 | - 7.7 |
| 1985 | | | | | | | | | | | | | | | | | | | | |
| Feb. | 1 | 0.8 | 0.9 | 0.8 | 742 | 0.9 | 1.0 | 0.8 | 735 | 0.8 | 0.9 | 0.8 | 738 | 0.1 | 0.2 | 0.1 | 637 | - 3.6 | - 2.3 | - 4.8 |
| | 2 | 0.8 | 0.9 | 0.8 | 743 | 0.9 | 1.0 | 0.8 | 736 | 0.9 | 1.0 | 0.8 | 739 | 0.1 | 0.2 | 0.1 | 637 | - 3.6 | - 2.3 | - 4.8 |
| | 3 | 0.8 | 0.9 | 0.8 | 744 | 0.8 | 1.0 | 0.6 | 737 | 0.8 | 0.9 | 0.7 | 740 | 0.1 | 0.2 | 0.1 | 638 | - 5.7 | - 1.2 | -10.1 |
| | 4 | 0.9 | 0.9 | 0.7 | 744 | 0.8 | 1.1 | 0.6 | 737 | 0.8 | 1.0 | 0.6 | 741 | 0.1 | 0.1 | 0.1 | 638 | - 2.5 | 0.7 | - 5.6 |
| | 5 | 0.9 | 1.0 | 0.9 | 745 | 0.9 | 1.1 | 0.7 | 738 | 0.9 | 1.0 | 0.9 | 742 | 0.1 | 0.1 | 0.1 | 638 | - 4.1 | - 1.8 | - 6.4 |
| | 6 | 0.8 | 1.0 | 0.7 | 746 | 0.6 | 0.9 | 0.4 | 739 | 0.7 | 0.9 | 0.6 | 742 | 0.0 | 0.1 | 0.0 | 638 | - 8.8 | - 5.2 | -12.4 |
| | 7 | 0.6 | 0.7 | 0.5 | 646 | 0.4 | 0.6 | 0.3 | 739 | 0.5 | 0.6 | 0.5 | 743 | - 0.1 | 0.0 | - 0.2 | 638 | -12.9 | - 7.9 | -17.8 |
| | 8 | 0.5 | 0.7 | 0.4 | 747 | 0.6 | 0.9 | 0.3 | 740 | 0.5 | 0.7 | 0.4 | 743 | - 0.3 | - 0.1 | - 0.5 | 638 | - 8.3 | 2.4 | -19.0 |
| | 9 | 0.5 | 0.7 | 0.4 | 748 | 0.4 | 0.6 | 0.3 | 740 | 0.5 | 0.6 | 0.4 | 744 | - 0.5 | - 0.4 | - 0.6 | 638 | - 8.7 | - 3.7 | -13.6 |
| | 10 | 0.7 | 0.9 | 0.5 | 748 | 0.8 | 1.0 | 0.6 | 741 | 0.7 | 0.9 | 0.6 | 744 | - 0.3 | - 0.2 | - 0.4 | 638 | - 3.3 | - 0.2 | - 6.3 |
| | 11 | 0.9 | 1.0 | 0.8 | 749 | 0.9 | 1.2 | 0.7 | 742 | 0.9 | 1.1 | 0.8 | 745 | - 0.1 | 0.0 | - 0.2 | 638 | - 1.9 | 0.5 | - 4.3 |
| | 12 | 0.9 | 1.0 | 0.8 | 750 | 0.9 | 1.2 | 0.7 | 743 | 0.9 | 1.1 | 0.8 | 746 | 0.0 | 0.1 | 0.0 | 638 | - 2.7 | 3.0 | - 8.4 |
| | 13 | 0.9 | 1.0 | 0.8 | 651 | 0.9 | 1.2 | 0.6 | 744 | 0.9 | 1.0 | 0.8 | 747 | 0.0 | 0.1 | 0.0 | 638 | - 3.5 | 2.3 | - 9.3 |
| | 14 | 0.9 | 1.0 | 0.8 | 752 | 0.9 | 1.2 | 0.6 | 745 | 0.9 | 1.1 | 0.8 | 748 | - 0.1 | 0.0 | - 0.1 | 638 | - 2.2 | 5.6 | -10.0 |
| | 15 | 0.9 | 1.0 | 0.8 | 753 | 0.9 | 1.2 | 0.6 | 746 | 0.8 | 1.0 | 0.7 | 749 | - 0.1 | 0.0 | - 0.1 | 638 | - 7.0 | - 2.8 | -11.1 |
| | 16 | 0.9 | 1.1 | 0.7 | 754 | 1.0 | 1.5 | 0.6 | 747 | 0.9 | 1.1 | 0.7 | 750 | 0.0 | 0.1 | 0.0 | 638 | - 2.1 | 6.5 | -10.7 |
| | 17 | 0.9 | 1.1 | 0.7 | 755 | 1.0 | 1.5 | 0.6 | 748 | 0.9 | 1.2 | 0.7 | 751 | 0.0 | 0.1 | 0.0 | 638 | 0.6 | 6.8 | - 5.6 |
| | 18 | 1.1 | 1.2 | 1.0 | 756 | 1.2 | 1.5 | 0.8 | 749 | 1.1 | 1.3 | 1.0 | 752 | 0.1 | 0.2 | 0.1 | 638 | 1.3 | 5.1 | - 2.6 |
| | 19 | 1.2 | 1.4 | 1.1 | 757 | 1.2 | 1.7 | 0.7 | 750 | 1.2 | 1.5 | 1.0 | 753 | 0.1 | 0.2 | 0.1 | 638 | - 1.8 | 4.0 | - 7.6 |
| | 20 | 1.0 | 1.2 | 0.9 | 758 | 0.9 | 1.3 | 0.6 | 751 | 1.0 | 1.1 | 0.9 | 754 | 0.1 | 0.2 | 0.1 | 638 | - 3.5 | 3.9 | -10.8 |
| | 21 | 1.0 | 1.2 | 0.8 | 759 | 0.9 | 1.4 | 0.5 | 752 | 1.0 | 1.2 | 0.8 | 755 | 0.1 | 0.2 | 0.1 | 638 | - 2.6 | 6.6 | -11.7 |
| | 22 | 0.9 | 1.1 | 0.8 | 760 | 0.9 | 1.4 | 0.5 | 753 | 0.9 | 1.1 | 0.7 | 756 | 0.1 | 0.2 | 0.1 | 638 | - 1.4 | 7.1 | - 4.3 |
| | 23 | 1.2 | 1.4 | 1.0 | 761 | 1.1 | 1.6 | 1.0 | 754 | 1.2 | 1.5 | 1.0 | 757 | 0.1 | | | 638 | 1.4 | 5.8 | - 1.1 |

Appendix 36. Spawning gravel particle size analysis for artificial and natural redds, Nechako River, 1980.

| Sample | Date | Location | % Retained in sieve (mm) Coarse sand and up >0.500 | Medium sand 0.250 | Sand 0.0625 | Silt <0.0625 | Sample wt. (g) |
|---|---|---|---|---|---|---|---|
| A | Nov. 8 | Cutoff Cr., (plant No. 1) | 96.1 | 3.0 | 0.8 | 0.1 | 835.6 |
| B | Nov. 8 | Cutoff Cr., (plant No. 1) | 96.4 | 2.4 | 1.1 | 0.1 | 1,316.6 |
| C | Nov. 8 | Cutoff Cr., (plant No. 3) | 96.7 | 2.3 | 0.9 | 0.1 | 1,265.1 |
| D | Nov. 8 | Cutoff Cr., (plant No. 3) | 96.5 | 2.4 | 1.1 | 0.0 | 367.0 |
| E | Nov. 8 | Cutoff Cr., (plant No. 3) | 97.1 | 2.3 | 0.6 | 0.1 | 994.6 |
| F | Nov. 8 | Cutoff Cr., (plant No. 2) | 87.4 | 8.8 | 3.4 | 0.4 | 426.6 |
| G | Nov. 8 | Cutoff Cr., (plant No. 2) | 94.9 | 4.0 | 0.9 | 0.2 | 189.3 |
| 1 | Nov. 26 | Artificial redd, (egg plant) | 96.1 | 2.8 | 0.8 | 0.3 | 1,260.3 |
| 2 | Nov. 26 | Artificial redd, (egg plant) | 95.1 | 3.4 | 1.2 | 0.3 | 799.7 |
| 3 | Nov. 26 | Natural redd | 96.8 | 1.8 | 1.3 | 0.1 | 1,867.1 |
| 3 | Nov. 26 | Natural redd | 96.8 | 2.2 | 0.8 | 0.2 | 769.9 |
| 3 | Nov. 26 | Natural redd | 96.4 | 2.5 | 1.0 | 0.1 | 926.9 |
| 3 | Nov. 26 | Natural redd | 95.3 | 2.8 | 1.7 | 0.2 | 1,351.1 |
| Mean | | | 95.5 | 3.1 | 1.2 | 0.2 | |

Appendix 37. Spawning gravel particle size analysis for an artificial redd, Nechako River, 1982.

| Sample | Date | Location | % Retained in sieve (mm) Coarse sand and up >0.500 | Medium sand 0.250 | Sand 0.0625 | Silt <0.0625 | Sample wt. (g) |
|---|---|---|---|---|---|---|---|
| 1 | Sept. 15 | Egg plant No. 1 | 95.2 | 3.2 | 1.3 | 0.3 | 863.9 |
| 2 | Sept. 15 | Egg plant No. 2 | 97.0 | 2.1 | 0.7 | 0.1 | 1,366.5 |